Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software

User's Guide

Software Version: A.01.01 and later

Agilent Part Number E8303-90001

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Agilent Technologies

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1 Product Description

This chapter provides a description of the Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software.

Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software

The Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software performs fast, accurate, and automated tests that determine the RF and audio performance of Motorola cellular telephone Base Stations.

The Test Software may be used for the installation, maintenance, and/or repair of Motorola HDII, HDII/NAMPS, and LD Base Stations.

Items Supplied

The Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software Package contains the following items.

- Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software PC Card.
  Agilent Technologies Part Number: E8303A-10001
- Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software User's Guide.
  Agilent Technologies Part Number: E8303A-90001
- SRAM card, 1-megabyte.
  Agilent Technologies Part Number: 0950-2635
- BTS Laptop Utility Software.
  Agilent Technologies Part Number E6961-10001
- DB9 to DB9 Cable (for connecting the Test Set to a PC).
  Agilent Technologies Part Number: 5182-4794
- DB9 to DB25 Cable (for connecting the Test Set to the Base Station.
  Agilent Technologies Part Number: 8120-8737
- Software licensing agreement

The SRAM card listed above is to be used for storing customized test programs and results, and must be initialized before use (see "Initializing a PC Card" on page 78).

Items Required

The equipment required to operate the Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software is as follows:

- Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set
- Agilent Technologies 8935 firmware revision A.01.10 or later
- Accessories: Agilent Technologies 83202A Base Station Accessory Kit
  or
  Other interconnect arrangements
- Optional Items:

  Printer and printer connection cable for documenting test results

  PC or HP® Palmtop computer and appropriate connection cable for storing test results

  Splitter, Agilent Technologies 83202A Switch Matrix, or Agilent Technologies 3488 Switch Matrix

Printers Supported

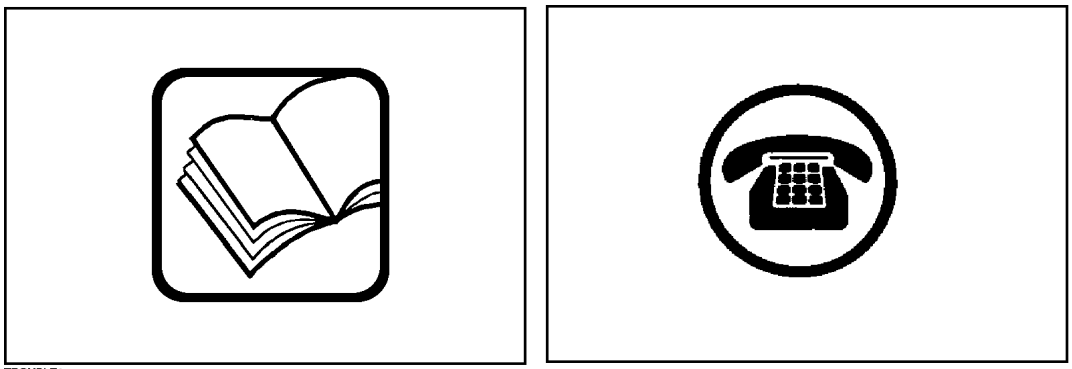
The following printers are supported by the Test Software:

- HP ThinkJet printer
- HP QuietJet printer
- HP PaintJet printer
- HP LaserJet printer
- HP DeskJet printer
- Epson FX-80
- Epson LQ-850

Additional Services Available

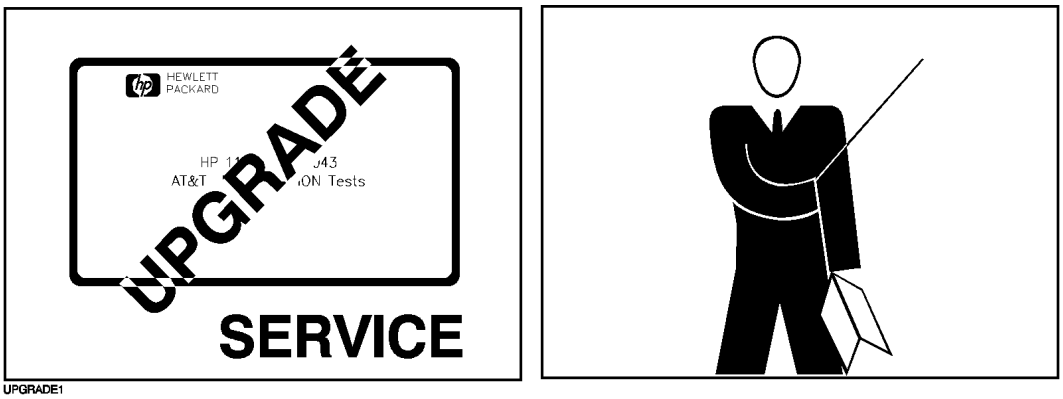
For information on services, see the *Agilent Technologies 8935 Series E6380A CDMA Test Set Assembly Level Repair Guide*, or call the Agilent Technologies Hotline (1-800-922-8920, USA and Canada only) and give the Test Software model number if you encounter a problem (see Figure 1-1).

Figure 1-1 Services



Contact the local Agilent Technologies Sales Representative for information about the Software Upgrade Service and the Start Up Assistance Training Course (see Figure 1-2).

Figure 1-2 Contacts



2 Introduction to Testing

This chapter provides information on loading the Test Software, setting up the Test Software, starting the test process, and the appropriate user responses to Test Software actions.

Overview

The Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software is used with the Agilent Technologies E6380A CDMA Base Station Test Set and various ancillary equipment in testing Motorola Base Stations for operation within prescribed limits.

The Test Software is designed for both ease of use and comprehensive testing. Operating the Test Software consists basically of a four-part process:

- Loading the Test Software, which consists of turning the Test Set on, inserting the Test Software card, and selecting a procedure.
- Setting up the Test Software for test operations.
- Initiating the TESTs.
- Responding to Test Set and Test Software actions.

This process is described in detail in this chapter.

What are Tests?

The terms “TESTS”, “TESTs”, and “tests” have different meanings. The following paragraphs describe these meanings.

TESTS

The SOFTWARE MENU screen is the user interface to the internal IBASIC controller. This screen will be displayed when you press the **Menu** key.

Sub-screens may be called from the SOFTWARE MENU screen. The title of each of these screens starts with the word “TESTS”, which refers to the capability of the Test Set to perform sequential steps, comparing measurements to specifications. It does not refer directly to the Test Software TESTs or to the tests described below. See “Customizing Test Procedures” on page 50.

The TESTS screens are accessed by selecting the fields under the **CUSTOMIZE TEST PROCEDURE:** and **SET UP TEST SET:** headings on the SOFTWARE MENU screen. These screens allow you to edit pass/fail limits, parameters, and other items that optimize the application of the Test Software.

TESTs

Combinations of measurements, adjustments, commands to the Base Station, and other program operations are performed in a series of TESTs. These TESTs are included in the Test Software, and are numbered 1 through 11. Each of the TESTs performs a specialized task.

The names of the TESTs are:

- TEST_01 – Laptop emulator
- TEST_02 – URDM or RDM frequency/level
- TEST_03 – Voice transceiver
- TEST_04 – Signaling transceiver MANUAL mode
- TEST_05 – Scanning receiver MANUAL mode
- TEST_06 – Combiner adjustment
- TEST_07 – Wideband data on active voice chan
- TEST_08 – Manual switch & calibration aid
- TEST_09 – Calculate transmitter power
- TEST_10 – Voice channel manual test mode
- TEST_11 – Test Menu

Tests

A test is a series of steps, or measurements, that determines if some item of Base Station performance is acceptable. Within each TEST is one “test” or more. For example, some of the tests performed in ‘TEST_02 - URDM or RDM Frequency/Level” are listed below:

- URDM #1 frequency error
- URDM #2 frequency error
- URDM #1 level
- URDM #2 level

Order of TESTs

You may run TEST_01 through TEST_11 in whatever order is best for the application. For example, you might wish to put “TEST_01 - Laptop Emulator” on page 98 before a TEST requiring that the cell site be taken out of service.

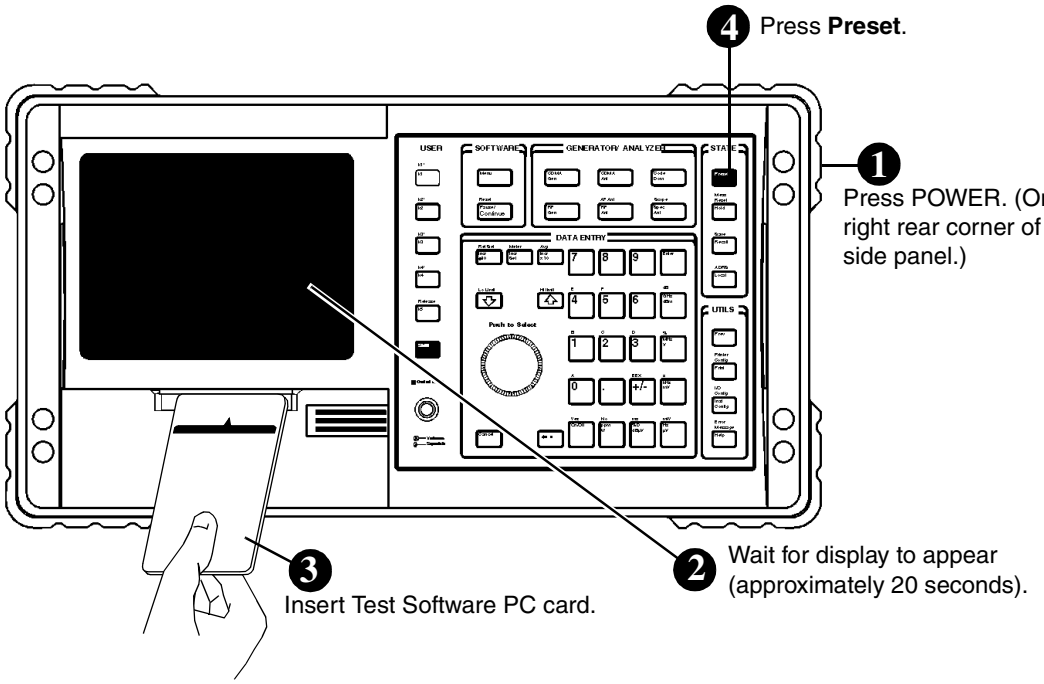
The formal order of TESTs is entered by accessing the TESTS (Order of Tests) screen, selecting TESTs from a menu, and entering those TESTs into a sequence. For instances in which you might like to run TESTs in an impromptu sequence, or run multiple TESTs out of sequence, you may do so by using “TEST_11 - Test Menu” on page 123. Both of these methods are described in this chapter.

Loading the Test Software

Before you begin testing, you must load the Test Software into the Test Set internal memory. The Test Software loading process is accomplished in ten steps as outlined in this section.

Figure 2-1 outlines the first four steps, which consist of turning the Test Set power on, inserting the Test Software PC card into the card slot on the Test Set front panel, and initializing the Test Set.

Figure 2-1 Preparing for Loading the Test Software

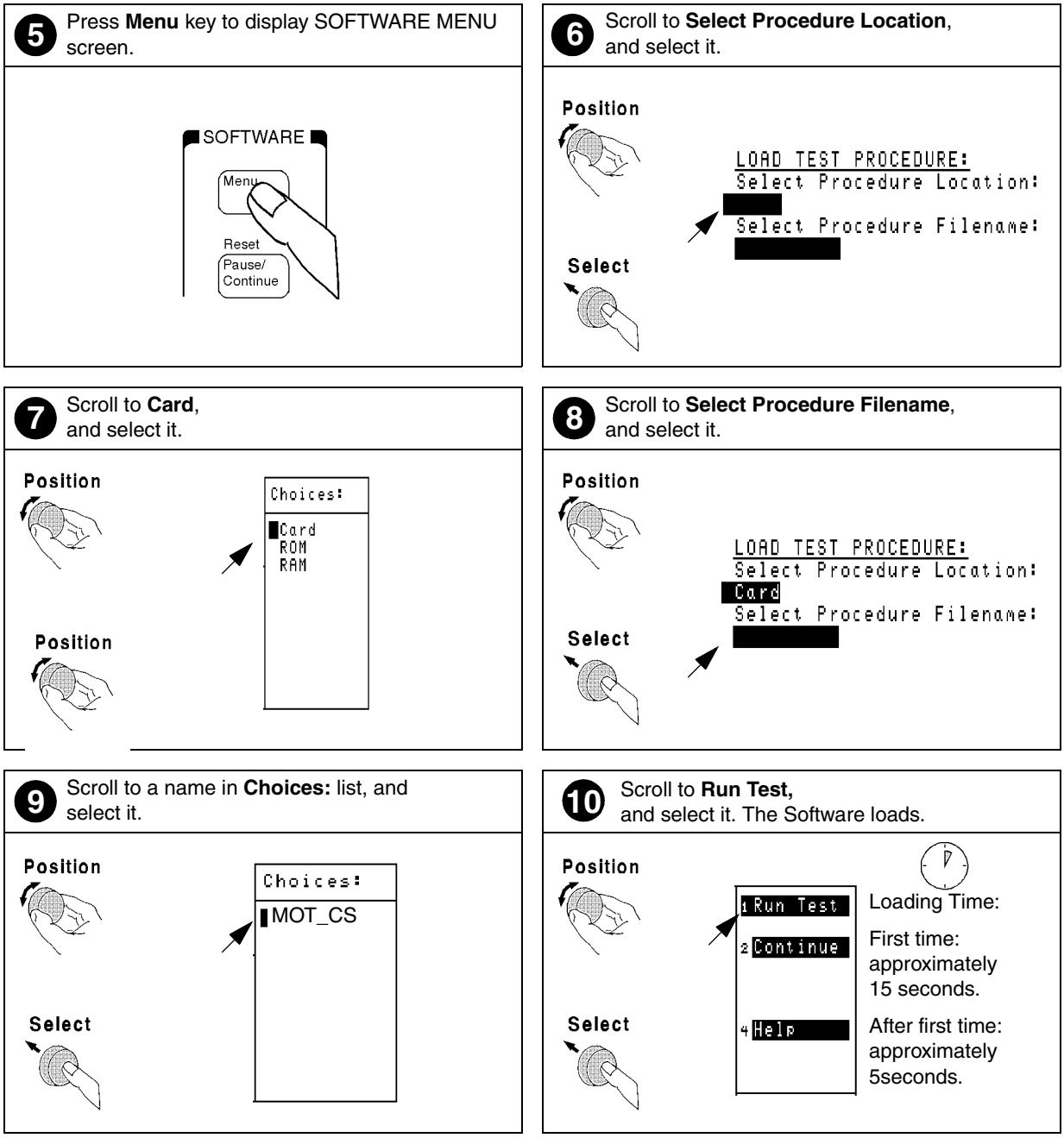

4 Press **Preset**.
1 Press POWER. (On right rear corner of side panel.)
2 Wait for display to appear (approximately 20 seconds).
3 Insert Test Software PC card.

The following illustration (see Figure 2-2) outlines the next six steps, which consist of operating the Test Set internal program to select and load the Test Software, select and load a test procedure, then run the Test Software.

NOTE When you insert the Test Software PC card and select a procedure for the first time, the Test Software is not actually loaded into the Test Set memory until you select **`Run Test`** or press the **`k1`** (**`Run Test`**) key. Loading the Test Software for the first time will require approximately 15 seconds. The Test Software will remain in the Test Set memory (power for which is backed up by a battery) after a power-off/power-on cycle unless it is deleted manually or a new program is loaded.

On the Test Software PC card is one pre-programmed procedure. This procedure, MOT_CS, contains a particular setting of testing order, parameter, and pass/fail limit defaults that define a set of optimization tests for Motorola LD and HDII Base Stations. This procedure may be modified to suit a particular application, then saved for future use.

Figure 2-2 Loading the Test Software



If the Test Software did not load properly, check the following:

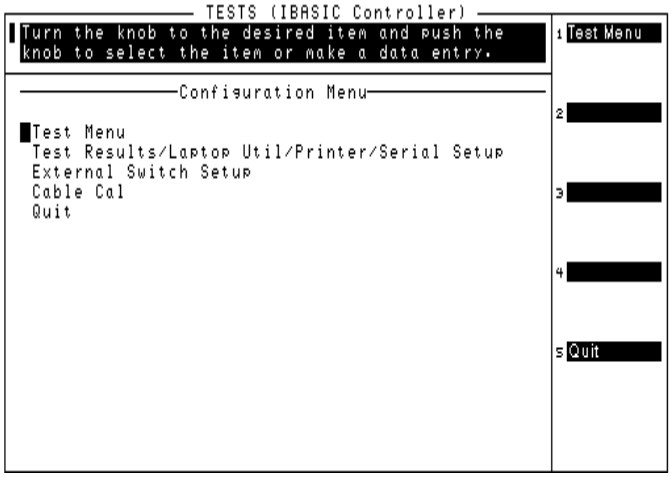
- Is the Test Set power on?
  Is there a display?
  Is the CDMA ANALYZER screen on the display?
- Check the AC power connection. See the *Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set User's Guide*.
- Is the Test Software PC card inserted properly?
- Is the Test Software PC card firmly seated in the slot?
  It should slide in loosely, then require a firm push to seat properly.
- Was the SOFTWARE MENU screen displayed?
  Pressing the **Preset** key should display the CDMA ANALYZER screen.
  Pressing the **Menu** key should display the SOFTWARE MENU screen.

NOTE If the Test Set displays an error message that states, "One or more self-tests failed.", there is a hardware problem. In such case, refer to the *Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set Assembly Level Repair Guide*. If the problem persists, call the Agilent Technologies Factory Hotline from anywhere in the USA or Canada (1-800-922-8920), 8:30 AM to 5:00 PM, Pacific time.

Setting up the Test Software

The Test Software displays the Configuration Menu screen (see Figure 2-3) upon initiation of the software and prior to running any procedure. All Test Software operations are started from this screen. The following sections describe the fields and the operations that are initiated from the fields.

Figure 2-3 Configuration Menu Screen



Test Menu

Select the **`Test Menu`** field or press the **`k1`** (**`Test Menu`**) key to display the Test Menu screen.

The Test Menu screen fields are described in the following paragraphs:

Quit Field

Select the **`Quit`** field or press the **`k5`** (**`Quit`**) key to close the Test Software.

TEST_01: Laptop Emulator Field

Select the **`TEST_01: Laptop Emulator`** field to send commands to the Base Station and view messages sent from the Base Station.

TEST_02: URDM or RDM Frequency Level Field

Select the **`TEST_02: URDM or RDM frequency level`** field to check the performance of the Base Station URDM or RDM.

TEST_03: Voice Transceiver Field

Select the **`TEST_03: Voice Transceiver`** field to check and optimize the performance of the Base Station voice communication transceiver.

TEST_04: Signaling Transceiver MANUAL Mode

Select the **`TEST_04: Signaling Transceiver`** field to check the performance of the Base Station signaling transceiver and to calibrate the receiver, all in manual mode.

TEST_05: Scanning Receiver MANUAL Mode

Select the **`TEST_05: Scanning receiver MANUAL Mode`** field to check the performance of the scanning receivers and to calibrate the receivers, all in manual mode.

TEST_06: Combiner Adjustment

Select the **`TEST_06: Combiner Adjustment`** field to use the voice transceiver or the signaling unit as a signal source to adjust the power combiner, all in manual mode.

TEST_07: Wideband Data on Active Voice Chan

Select the **`TEST_07: Wideband data on active Voice chan`** field to measure the wideband deviation of a voice transceiver without taking the cell site out of service.

TEST_08: Manual Switch & Calibration Aid

Select the **`TEST_08: Manual switch & calibration aid`** field to run any of several routines to calibrate and control cell site equipment. The Test Software will display the menu that allows you to select the routine to run.

- Select the **`Done`** field when you have completed all of the operations.
- Select the **`Go to the Laptop screen`** field to invoke the Laptop Emulator mode.
- Select the **`Set the Agilent Technologies 8935 for RX path calibration`** field to configure the Test Set for receive path calibration.
- Select the **`Read the spec. analyzer TX path calibration`** field to view the results of the spectrum analyzer for the transmit path calibration.
- Select the **`Read the spec. analyzer RDM calibration`** field to view the results of the spectrum analyzer for the RDM calibration.
- Select the **`Tune the Agilent Technologies 8935 to a channel number`** field to set the Test Set to a desired channel number.

TEST_09: Calculate Transmitter Power

Select the **TEST_09: Calculate Transmitter Power** field to display the menu that allows you to enter the specifications on which the Test Software will calculate the maximum permissible transmitter power, given the effective radiated power (ERP) limit, the antenna gain, and the losses of various items in the system.

- Select the **Done** field when you have completed all of the entries.
- Select the **Transmit ERP =** field to enter the effective radiated power, in watts.
- Select the **Antenna gain =** field to enter the antenna gain, in dB.
- Select the **Amount of 7/8 inch foam cable =** field to enter the foam cable length, in feet.
- Select the **Amount of 1 1/4 inch foam cable =** field to enter the foam cable length, in feet.
- Select the **Amount of 1 5/8 inch foam cable =** field to enter the foam cable length, in feet.
- Select the **Amount of 1 5/8 inch air cable =** field to enter the air cable length, in feet.
- Select the **Amount of 1/2 inch foam jumper =** field to enter the foam jumper length, in feet.
- Select the **Amount of 1/2 inch superflex jumper =** field to enter the superflex jumper length, in feet.
- Select the **Lightning suppressor attenuation =** field to enter the amount of attenuation, in dB.
- Select the **Other component(s) loss =** field to enter the total amount of loss through another component (or more), in dB.
- Select the **Mismatch loss =** field to enter the amount of mismatch loss, in dB.
- Select the **Number of connectors =** field to enter the number of connectors in the system.

TEST_10: Voice Channel MANUAL Test Mode

Select the **TEST_10: Voice channel MANUAL test mode** field to check various parameters of a voice transceiver, usually after changes to test conditions or test sequence.

Return Field

Select the **Return** field to return to the Configuration Menu screen.

Test Results/Laptop Util/Printer/Serial Setup

Select the **Test Results/Laptop Util/Printer/Serial Setup** field to display the Test Results/Laptop Util/Printer/Serial Setup menu screen. The Test Results/Laptop Util/Printer/Serial Setup screen fields are described in the following paragraphs:

Return Field

Select the **Return** field to return to the Configuration Menu screen.

Edit Test Results Header Field

Select the **Edit Test Results Header** field to edit or enter the header text. Edit or add text using selections from the **Choices:** list in the lower right-hand area of the screen. The text will appear as entered in the box at the top of the screen.

Select **Done** when finished. The text that you edited or entered will then appear at the beginning of the test results.

Use BTS Laptop Utility Field

NOTE

The BTS Laptop Utility is a PC-based program that allows you to view and save test results on a PC. If the utility is loaded on the PC, and you wish to send the test result to the PC, toggle this field to **Yes**. For more information on this subject, see "Sending Test Results to a PC Using the BTS Laptop Utility Program" on page 62.

Select the **Use BTS Laptop Utility** field to select whether you wish to use the utility. When you select the field, the **Yes/No** section of the field will toggle.

If it is set to **No**, and you toggle it to **Yes**, three fields will be displayed below: **Serial Port 9 Settings**, **Send Test Page to BTS Laptop Utility TR Window**, and **Echo BTS communications to**. These fields are described in subsequent paragraphs.

If it is set to **Yes**, and you toggle it to **No**, six fields will be displayed below: **Send Test Results to Printer at**, **Send Test Results to**, **Serial Port 9 Settings**, **Print Setup**, **Print Test Page**, and **Echo BTS communications to**. These fields are described in subsequent paragraphs.

Toggle to Yes – If you toggle the **Use BTS Laptop Utility** field to **Yes**, set the three fields as described in the following three sub-sections.

Serial Port 9 Settings Field

NOTE For this Test Set to communicate with the PC, the serial port configuration on the Test Set and the PC must match. This field allows you to configure the Test Set port to match the PC Port.

- Select the **`Serial Port 9 Settings`** field to configure the SERIAL 9 port. The Test Software will display the Serial Port 9 Settings menu screen. This screen allows you to match the configuration of the SERIAL 9 port to that of the port of the PC or similar device to which data will be transmitted. When you select each field in the screen, a drop-down **`Choices:`** list will appear so that you may set the values as appropriate.
  - For **`Serial Baud`**, select **`300`** to **`115200`** baud.
  - For **`Parity`**, select **`None`**, **`Odd`**, **`Even`**, **`Marking`**, or **`Spacing`**.
  - For **`Data Length`**, select **`7 bits`** or **`8 bits`**.
  - For **`Stop Length`**, select **`1 bit`** or **`2 bits`**.
  - For **`Flow Control`**, select **`None`**, **`Xon/Xoff`**, or **`Hardware`**.
- Select the **`Return`** field or press the **`k5`** (**`Return`**) key when finished to return to the previous screen.

Send Test Page to BTS Laptop Utility TR Window Field

Select the **`Send Test Page to BTS Laptop Utility TR Window`** field to test the connection between the Test Set and the PC that is running the BTS Laptop Utility program. The Test Software will transmit one page of data to the **Test Results** (TR) window as a test.

Echo BTS Communications to Field

Select the **`Echo BTS communications to`** field to select whether the Test Software will send an echo of the commands exchanged between the Test Set and the Base Station, and, if so, the destination of that information. The Test Software will display a drop-down **`Choices:`** list that offers five choices.

If you select **`Off`**, the Test Software will not echo the commands to another destination.

If you select **`Serial 9`**, **`Parallel 15`**, or **`HP-IB 701`**, the Test Software will echo the commands to the respective port.

If you select **`Display`**, the Test Software will echo the commands to the Test Set screen and display those commands along with the test results.

Toggle to No – If you toggled the **`Use BTS Laptop Utilities`** field to **`No`**, set the six fields as described in the following six sub-sections.

Send Test Results to Printer at Field

NOTE Test results are always displayed on the Test Set screen. In addition, you may direct the Test Software to send the results to a printer.

Select the **`Send Test Results to Printer at`** field to indicate to the Test Software the port address of the printer connection. Select the address from the list in the drop-down **`Choices:`** list.

- If you select **`Off`**, no port will be used for transmitting test results to a printer.
- If you select **`Serial 9`**, **`Parallel 15`**, and **`HP-IB`**, the selected port will be used for transmitting test results to a serial, parallel, or HP-IB printer, respectively.
- If you select the HP-IB printer, you must enter its address in the field.

For more information, see "Sending Test Results to a Serial Printer" on page 73, "Sending Test Results to a Parallel Printer" on page 74, and "Sending Test Results to an HP-IB Printer" on page 75.

Send Test Results to Field

NOTE In addition to test results being displayed on the Test Set screen, those results may be saved on an SRAM card or sent to a PC connected to the SERIAL 9 port. If you wish to send the results to a printer and also to a PC, this will require the use of a PC communication program such as ProComm®.

Select the **`Send Test Results to`** field to indicate to the Test Software the destination to which you wish to send test results. Select the destination from the drop-down **`Choices:`** list.

- If you select **`Off`**, the Test Software will assume no destination (other than the Test Set screen) for test results.
- If you select **`Serial 9`**, the Test Software will transmit the test results to a device connected to the SERIAL 9 port. For more information, see "Sending Test Results to a PC" on page 65.
- If you select **`PC Card`**, the test results will be sent to an SRAM card. In such case, you must insert an initialized SRAM card into the Test Set front panel card slot. For more information, see "Retrieving Data from an SRAM Card" on page 69.

Serial Port 9 Settings Field

Select the **`Serial Port 9 Settings`** field to configure the SERIAL 9 port. See the earlier description of this field.

Print Setup Field

Select the **Print Setup** field to set the print configuration. The Test Software will display the Print Setup menu screen.

- Enter the desired value for the **Lines/page** field.
- Set the toggles appropriately for the **Form feed at start of page** and **Form Feed at end of page** fields.
- Select the **Printer model** field to choose the printer model from the drop-down **Choices:** list.

Select the **Return** field or press the **k5** (**Return**) key when finished to return to the previous screen.

Print Test Page Field

Select the **Print Test Page** field to check the connection between the Test Set and the printer before a test. The Test Software will send one page of data to the printer as a test.

NOTE A printer must be connected to a Test Set port and set up for printing, and the **Send Test Results to Printer at** field must be set to the port to which the printer is connected in order to print a test page.

Echo BTS Communications to Field

Select the **Echo BTS Communications to** field to select whether the Test Software will send an echo of the commands between the Test Set and the Base Station, and, if so, the destination of the information. See the earlier description of this field.

External Switch Setup

Select the **External Switch Setup** field to display the External Switch Setup menu screen. The fields in the External Switch Setup menu screen are described in the following paragraphs:

Return Field

Select the **Return** field or press the **k5** (**Return**) key to return to the Configuration Menu screen.

Antenna Switch Control Field

Select the **`Antenna Switch Control`** field to select the method for antenna path connection. The Test Software will display a drop-down **`Choices:`** list that offers four selections: **`Off`**, **`Splitter`**, **`3488`**, and **`83202A`**.

- Selecting **`Off`** indicates to the Test Software that you will make all antenna connections manually.
- Selecting one of the other three items indicates to the Test Software that you will use that device. If an Agilent Technologies 83202A Switch Matrix or an Agilent Technologies 3488 Switch Matrix is used, the Test Software will then command it to switch the antenna connections as appropriate to the test and will display the appropriate prompts on the Test Set screen. If you select the Agilent Technologies 3488 Switch Matrix, you must enter the HP-IB address in its field.

NOTE A Splitter is a widely available and relatively simple device that converts one signal path into multiple signal paths. All such paths are active and are not switchable.

Cable Cal

Select the **`Cable Cal`** field to initiate the cable loss measurement. The Test Software will display the first of two cable loss test connection diagrams. Follow the screen prompts to make the measurement.

Save the value for each receiver antenna cable, RX1 through RX6, by selecting the appropriate **`Save RX1`** ⇒ through **`RX6`** ⇒field on the Cable Loss menu screen. If the same value is appropriate for multiple cables, save it to each field in turn. It is not necessary to repeat the measurement.

Save the value for each transmitter antenna cable, TX1 through TX8 and TXC, by selecting the **`appropriate Save TX1`** ⇒through **`Save TX8`** ⇒field or the ⇒field on the same screen. If the same value is appropriate for multiple cables, save it to each field in turn. It is not necessary to repeat the measurement.

If you wish to measure multiple cables, select the **`Repeat or Test next cable`** field and repeat the measurement process as required.

Select the **`Return`** field or press the **`k5`** (**`Return`**) key when finished to return to the Configuration Menu screen. For more information, see “Cable Cal” on page 89.

Quit

Select the **`Quit`** field or press the **`k5`** (**`Quit`**) key to close the Test Software.

Determining the RDM Level Correction Factor

The method of measurement described in the following paragraphs may be used to obtain a value for PARAMETER_11 RDM level correction factor. The Test Software will use this correction factor to enhance the accuracy of 3-MHz level measurements using the Test Set spectrum analyzer.

In the procedure, the Test Software will measure the level of the 3-MHz RDM/URDM signal using a power meter, then measure it on the Test Set spectrum analyzer. The spectrum analyzer will center the 3-MHz signal on the display, then determine the difference between the power meter reading and the spectrum analyzer reading.

Determine this calibration factor as follows:

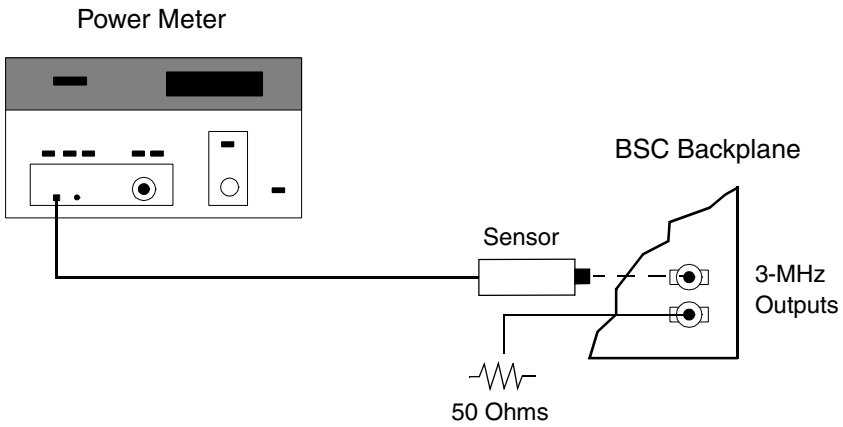
Step 1. Zero the power meter if required.

Step 2. Set the power meter calibration factor if required.

Step 3. Remove the 50-ohm load that is on the URDM/RDM Phono #2 jack.

Step 4. Connect the power meter sensor to an adapter that is attached to the URDM/RDM Phono #2 jack (see Figure 2-4).

Figure 2-4 RDM Level Correction - POWERREF Measurement

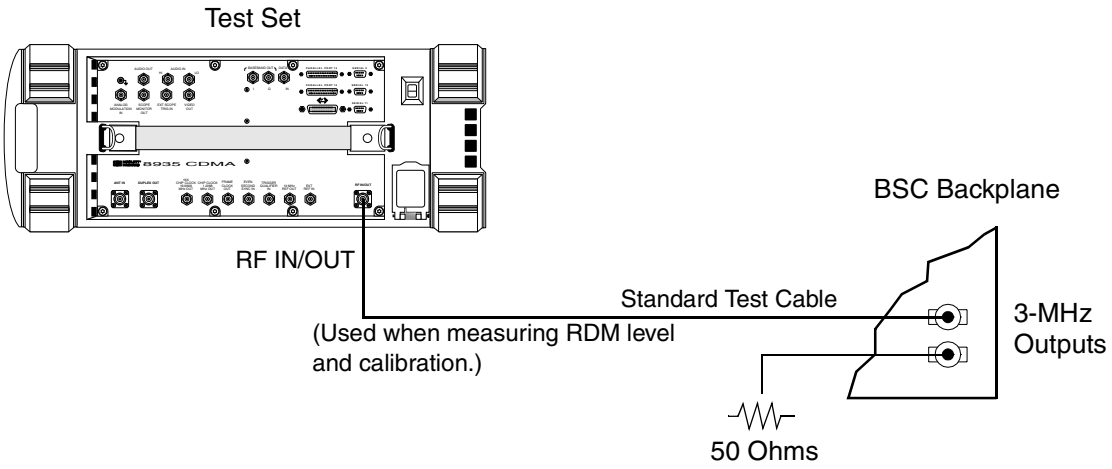


Step 5. Record the power meter reading in dBm as POWERREF.

Step 6. Disconnect the power meter sensor.

Step 7. Connect a standard test cable between the 3 MHz Phono #2 jack, and the Test Set RF IN/OUT connector (see Figure 2-5).

Figure 2-5 RDM Level Correction - POWER8935 Measurement



Step 8. Perform the following sub-steps:

NOTE This procedure may be performed automatically by running TEST_08 - Manual Switch and Calibration Aid, and selecting the **`Read the spec. analyzer RDM calibration field`**.

1. Press the **Preset** key. The Test Set will display the CDMA ANALYZER screen.
2. Select the title bar at the top of the screen, then select the **`SPECTRUM ANALYZER`** field. The Test Set will display the SPEC ANL screen.
3. From the **`Controls`** menu, select the **`Main`** field. The Main menu will appear at the bottom of the screen.
4. Select the **`Center Freq`** field. Enter 3 MHz.
5. Select the **`Span`** field. Enter `50` kHz.
6. From the **`Controls`** menu, select the **`Marker`** field. The Marker menu will appear at the bottom of the screen.
7. Under the first **`Marker To`**, select the **`Peak`** field.
8. Under the second **`Marker To`**, select the **`Ref Level`** field.
9. From the **`Controls`** menu, select the **`Auxiliary`** field. The Auxiliary menu will appear at the bottom of the screen.
10. Under **`Sensitivity`**, select the lower field and enter **`2 dB/div`**.
11. From the **`Controls`** menu, select the **`Marker`** field.
12. Under the first **`Marker To`**, select the **`Peak`** field.
13. Under the second **`Marker To`**, select the **`Ref Level`** field.

14. From the **Controls** menu, select the **Main** field. The Main menu will appear at the bottom of the screen.
15. Select **Ref Level**.
16. Under **Ref Level**, select the field and, using either the numeric keypad in the DATA ENTRY keys or the cursor control knob, enter a value to increase the reference level on the spectrum analyzer by 8 dB. You may change the resolution of the reference level adjustment by pressing the **INCR÷10** key or the **INCRx10** key.
17. Verify that the peak of the signal is close to the center of the spectrum analyzer display.
18. Under the first **Marker To**, select **Peak**.
19. Record the **Marker Lvl** (in the upper right corner of the screen) as POWER8935 in dBm.

Step 9. Calculate the calibration parameter using the following formula:

Calibration parameter = POWERREF – POWER8935

Step 10. Enter the value obtained into PARAMETER_11 RDM level correction factor. Make certain to enter the sign of the value. The value obtained in step 9 is added to spectrum analyzer readings made by the Test Software, thus improving accuracy.

Initiating Testing

After setting all relevant fields on the Configuration Menu screen (and other screens accessed from that screen) to appropriate values, initiate testing by either selecting the **`Begin Test`** field or pressing the **`k1`** (**`Begin Tst`**) key. If a test has been run before, the Test Software probably will still be in the Test Set internal memory, and it will run. If not, the Test Set will load the Test Software, including the procedure previously selected on the SOFTWARE MENU screen, into its internal RAM, and then run the Test Software.

Responding to Test Set and Test Software Actions

This section provides information on actions that you might be required to perform during the testing process.

Test Flow

When you select the **`Begin Test`** field or press the **`k1`** (**`Begin Tst`**) key, the Test Software will establish communication with the Base Station. Once communication is established, the Test Software will control the Base Station so that it operates in the various modes required for efficient testing. During operation in each mode, the Test Software will control the Test Set to measure the required RF and audio characteristics of the Base Station.

At appropriate points in the testing process, the Test Software will pause, then prompt you to perform some required action or actions. These prompts might require that you turn the Base Station on or off, make or change connections, or perform adjustments.

At the end of a test sequence, the Test Software will display a summary of the test results, showing the number of data points at which the test passed and the number at which the test failed.

Also, at the end of a test sequence, the Test Software will display the time elapsed during the test.

Dependent upon the testing regimen, you might wish to perform certain tests again to obtain more complete information on tests that failed, or you might wish to perform the entire test sequence again.

Actions if a Test Fails

If PARAMETER_04 GN perform extended tests [0=no 1=yes] is set to 1, the Test Software will prompt you to press one or more of the following keys.

`Proceed` Key

Press the **`k1`** (**`Proceed`**) key to continue test operations after a pause.

`Repeat` Key

Press the **`k2`** (**`Repeat`**) key to perform a test again.

`Abort` Key

If it is displayed, press the **`k4`** (**`Abort`**) key at any time during the testing process to stop the test sequence. The Test Software will stop the test and display a summary of the testing to the point of stoppage.

`Laptop` Key

If it is displayed, press the **`k5`** (**`Laptop`**) key to invoke the Laptop Emulator Mode at any point during the testing process that you wish to send a command to the Base Station to cause it to perform some specific action. For more information on this mode, see “Laptop Emulator” on page 90.

Actions if Adjustment Is Required

At points at which adjustment is required, the Test Software will prompt you to press one or more of the following keys.

`No Retest` Key

Press the **k1** (**`No Retest`**) key in instances in which you do not wish to have the Test Software repeat the test after an adjustment.

`Retest` Key

Press the **k2** (**`Retest`**) key in instances in which you wish to have the Test Software repeat the test after an adjustment.

`Not Set` Key

Press the **k3** (**`Not Set`**) key in instances in which the prompted adjustment cannot be performed.

`Tns loud/Tns quiet/Tns off` Key

Press the **k4** (**`Tns loud/Tns quiet/Tns off`**) key to set the level of the audible signals produced by the Test Set audio tone generator during pauses for adjustments. The tone may be set to loud, quiet, or off. Press the key repeatedly until the desired audio level is obtained.

`Laptop` Key

If it is displayed, press the **k5** (**`Laptop`**) key to invoke the Laptop Emulator Mode at any point during the testing process that you wish to send a command to the Base Station to cause it to perform some specific action. For more information on this mode, see “Laptop Emulator” on page 90.

3 Connections

This chapter provides information on equipment required for Base Station testing, and cell site equipment, serial port, printer, and switch control connections.

Equipment Required

The following equipment is required for testing:

- Cellular Site Base Station to test.
- Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set.
- Agilent Technologies 83202A Base Station Accessory Kit (recommended, but not required).

Accessory Kit Cables, Connectors, and Small Accessories

The cables, connectors, and small accessories listed in Table 3-1 may be purchased together in the Agilent Technologies 83202A Base Station Accessory Kit or separately through a local vendor.

CAUTION The Test Set and other equipment in this test system are susceptible to damage by transient RF power, continuous RF power, high voltage, electrostatic discharge from cables and other sources, and transients caused by lightning. Connections to equipment, switch settings, and power-on conditions must be selected and accomplished carefully to reduce the risk of damage to the equipment.

Table 3-1 Accessory Kit Contents

Description	Purpose	Quantity	Part Number
Directional couplers	Allows connecting Test Set to receiver and transmitter antennas	4	0955-0711
50-ohm SMA(m) termination	Terminates coupler port	4	0960-0053
N(f)-to-N(f) Adapter	For VSWR and cable calibration	1	1250-0777
N(m)-to-N(m) Adapter	For VSWR and cable calibration	1	1250-0778
N(m)-to-BNC(f) Adapter	To adapt Test Set RF IN/OUT connector for RDM/URDM measurements	1	1250-0780
SMA(f)-to-N(m) Adapter	Connects to Test Set RF IN/OUT	1	1250-1250
Phone jack-to-BNC(f) Adapter	For measuring RDM and URDM power	1	1250-1853
BNC(m)-to-SMA(f) Adapter	Connects to Test Set DUPLEX OUT	2	1250-2015
BNC(m)-to-Banana(f) Adapter	Connects to Test Set AUDIO IN HI/LO	2	1250-2164
Banana(m)-to-BNC(f) Adapter	Connect across Test Set AUDIO IN HI/LO	1	1251-2277
SMA(m)-to-SMA(m) 20 ft cable	From couplers to Switch Matrix and to Test Set RF IN/OUT	5	08921-61006
BNC(m)-to-BNC(m) 15-ft. cable	Test Set AUDIO OUT to switch and Test Set RF IN/OUT to phone jack	1	08921-61007
Bantam 309-to-BNC(m) 15-ft cable	From transceiver to Test Set and to switch	2	08921-61008

Table 3-1 Accessory Kit Contents

Description	Purpose	Quantity	Part Number
DB37-to-DB37 10-ft. ribbon cable	From Test Set to Switch Matrix (used with Agilent 8921A only)	1	08921-61013
RJ11(m)-to-RJ11(m) 6-wire 25-ft. twisted cable	Connects to dual port splitter and to RJ11-to-DB25 Adapter (used with Agilent 8921A only)	1	08921-61015
RJ11(f)-to-DB25(m) Adapter	Connects to TTYMP #8	1	08921-61016
RJ11(m)-to-RJ11 (f) dual-port, 6-wire splitter	Connects to Test Set rear panel serial port (used with Agilent 8921A only)	1	08921-61031
DB9(f)-to-RJ11(m) 4-wire cable	For data collection (used with Agilent 8921A only)	1	08921-61038
DB25(m)-to-RJ11(m) 4-wire cable	For data collection (used with Agilent 8921A only)	1	08921-61039
Dual miniphone cable	From Switch Matrix to Base Station (RCV & TEST jacks)	2	08921-61040
Switch Matrix	Automates switching between receive antennas and audio paths	1	83202A K02

Miscellaneous Accessories

Miscellaneous accessory items are also required for testing the Base Station. These items are described in the following paragraphs.

RF and Audio Switching

The Test Software supports two methods for switching RF and audio paths.

The first uses the an optional Splitter or Switch Matrix. Splitters are widely available and may be obtained from any of several manufacturers. The Agilent Technologies 83202A Switch Matrix and the Agilent Technologies 4388 Switch Matrix are available from Agilent Technologies.

The second uses manual switching of all connections.

It is highly recommended that you select either a Splitter or one of the Switch Matrix units. Manually switching signal paths is cumbersome and might result in time consuming troubleshooting.

RF Couplers

A directional coupler with low through-path loss is ordinarily installed in each of the RX and TX transmission lines leading to antennas. The RLC Model M3020A has the necessary characteristics. Refer to the Motorola cell site manual for another recommended model.

50-Ohm Terminations

It might be necessary to place a termination on the RX RF coupler port leading to the antenna to prevent received signals from affecting Base Station receiver tests.

While testing the SIG unit, a high-power load must be placed on the RF coupler output leading to the antenna. It must be capable of handling at least 30 watts. The load is required to prevent the SIG transmitter signal from being radiated to mobile stations. A 150-watt load is available from Lucas Aerospace (Part Number: M1428).

RF IN/OUT Cables

Connection from the RF IN/OUT connector to the coupled port of the TX coupler may be made with a cable with SMA connectors on both ends, and a Type N(m)-to-SMA(f) adapter (Pomona Part Number: 4297 or Agilent Technologies Part Number: 1250-1250).

The connection to the 3-MHz RDM/URDM output may be made using adapters and a coaxial cable with SMA connectors. Phono(m)-to-BNC(f) (Pomona part number 5319, Agilent Technologies Part Number: 1250-1853) and BNC(m)-to-SMA(f) (Pomona Part Number: 4289, Agilent Technologies Part Number: 1250-2015) adapters on the 3-MHz end, and an SMA(f)-to-N(m) (Pomona Part Number: 4297 or Agilent Technologies Part Number: 1250-1250) adapter on the RF IN/OUT end may be used.

Cable lengths should be as short as possible so that losses are minimized. Low-loss cable should be used. To improve accuracy, you might wish to have a set of calibrated standard test cables.

DUPLEX OUT Cable

Connection from the DUPLEX OUT to the common port of the RF switch may be made with a cable with SMA connectors on both ends. A Type N(m)-to-SMA(f) adapter (Pomona Part Number: 4297 or Agilent Technologies Part Number: 1250-1250) is required on the Test Set.

Cable lengths should be as short as possible so that losses are minimized. Low-loss cable should be used. To improve accuracy, you might wish to have a set of calibrated standard test cables.

RX Coupler to Switch Cables

Connection from the RX RF coupler to the RF switch ports may be made with cables with SMA connectors on both ends.

Cable lengths should be as short as possible so that losses are minimized. Low-loss cable should be used. To improve accuracy, you might wish to have a set of calibrated standard test cables.

Audio Cables

Bantam 309-to-BNC cables may be used for audio interconnections. Three cables are required, unless the Switch Matrix is used. In that case, two Bantam 309-to-Bantam 309 cables and two Bantam 309-to-BNC cables are required.

Two BNC(m)-to-banana(f) adapters (Pomona Part Number: 3430-0 black, 3430-2 red, Agilent Technologies Part Number: 1250-1263 gray), may be used to convert the AUDIO IN HI and LO connectors to banana type connectors. A banana(m)-to-BNC(f) adapter (Pomona Part Number: 1269 or Agilent Technologies Part Number: 1251-2277) is also required.

Switch Matrix Control Cables

A control cable is required between the Test Set and the Switch Matrix.

The Agilent Technologies 83202A Switch Matrix requires a parallel printer cable to connect the PARALLEL 15 port to the Centronics connector on the Switch Matrix. This is a standard DB25(m)-to-36-pin Centronics(m) cable (Agilent Technologies Part Number: C2951A).

The Agilent Technologies 3488 Switch Matrix requires an HP-IB cable to connect the Test Set HP-IB port to the HP-IB connector on the Switch Matrix. This is a standard HP-IB cable.

NOTE

The parallel printer cable mentioned above for the Agilent Technologies 83202A Switch Matrix and below for the parallel printer may be the same cable. Because both devices connect to the Test Set PARALLEL 15 port, you may use either the Agilent Technologies 83202A Switch Matrix or the parallel printer at any time. Thus, only one cable is required.

The HP-IB cable mentioned above for the Agilent Technologies 3488 Switch Matrix and below for the HP-IB printer are the same type cable. Because connectors may be stacked on the Test Set HP-IB port, you may use both the Agilent Technologies 3488 Switch Matrix and an HP-IB printer at the same time. However, two cables will be required.

Printer Cables

If a parallel printer is part of the test system, it will require a parallel printer cable to connect the PARALLEL 15 port to the Centronics connector on the Switch Matrix unit. This is a standard DB25(m)-to-36-pin Centronics(m) cable (Agilent Technologies Part Number: C2951A).

If an HP-IB printer is part of the system, it will require an HP-IB cable to connect the Test Set to the printer. This is a standard HP-IB cable.

VSWR and Cable Fault Ancillary Equipment

If the test plan requires the VSWR or cable fault tests that are included in the RF Tools section of the ROM-based utilities, the Agilent Technologies 8935 RF Tools Accessory Kit will be required (Agilent Technologies Part Number: 6654A).

High Accuracy Frequency Reference

To verify the performance of the URDM and the frequency accuracy of NAMPS signals, a highly accurate 10-MHz reference source is required. The Electronic Research Co. Model 130 has the required characteristics.

Cell Site to Test Set Connections

Many arrangements of test equipment and cell site equipment are possible. In this manual, two of these possibilities are presented:

- Testing using hard connections to receiver and transmitter antennas.
- Testing using coupling to the directional coupler for the receiver and transmitter antennas.

After you set up the system, you must calibrate some system components before initiating testing. After calibration, tests must be performed with the equipment connected the same way it was connected when calibrated.

See Figure 3-1 on page 43 for an overall system block diagram.See Figure 3-2 on page 44 and Figure 3-3 on page 45 for connecting the Test Set to the Base Station.

Figure 3-1 Overall System Block Diagram

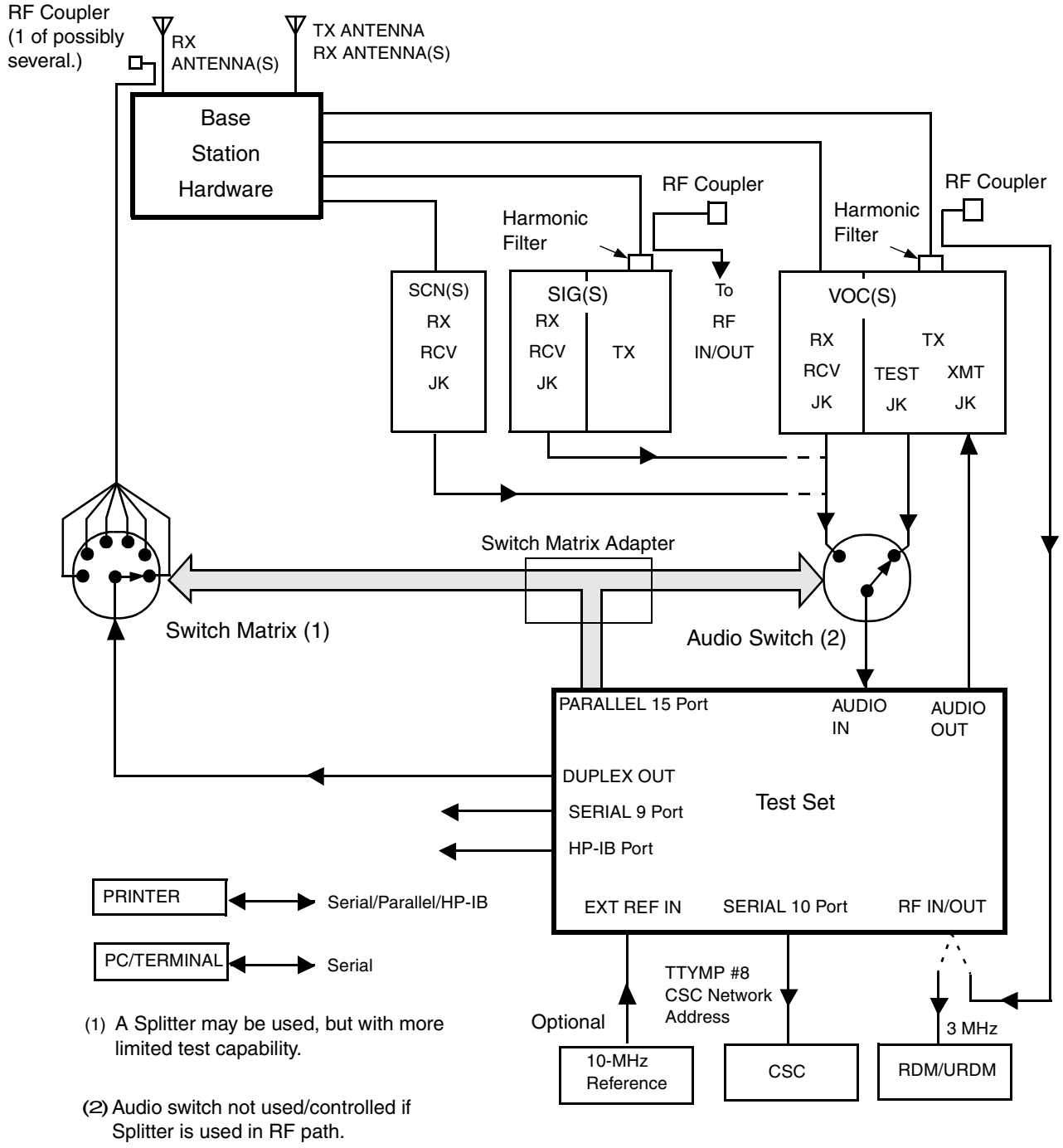


Figure 3-2 Connecting the Test Set to the Base Station (Part 1)

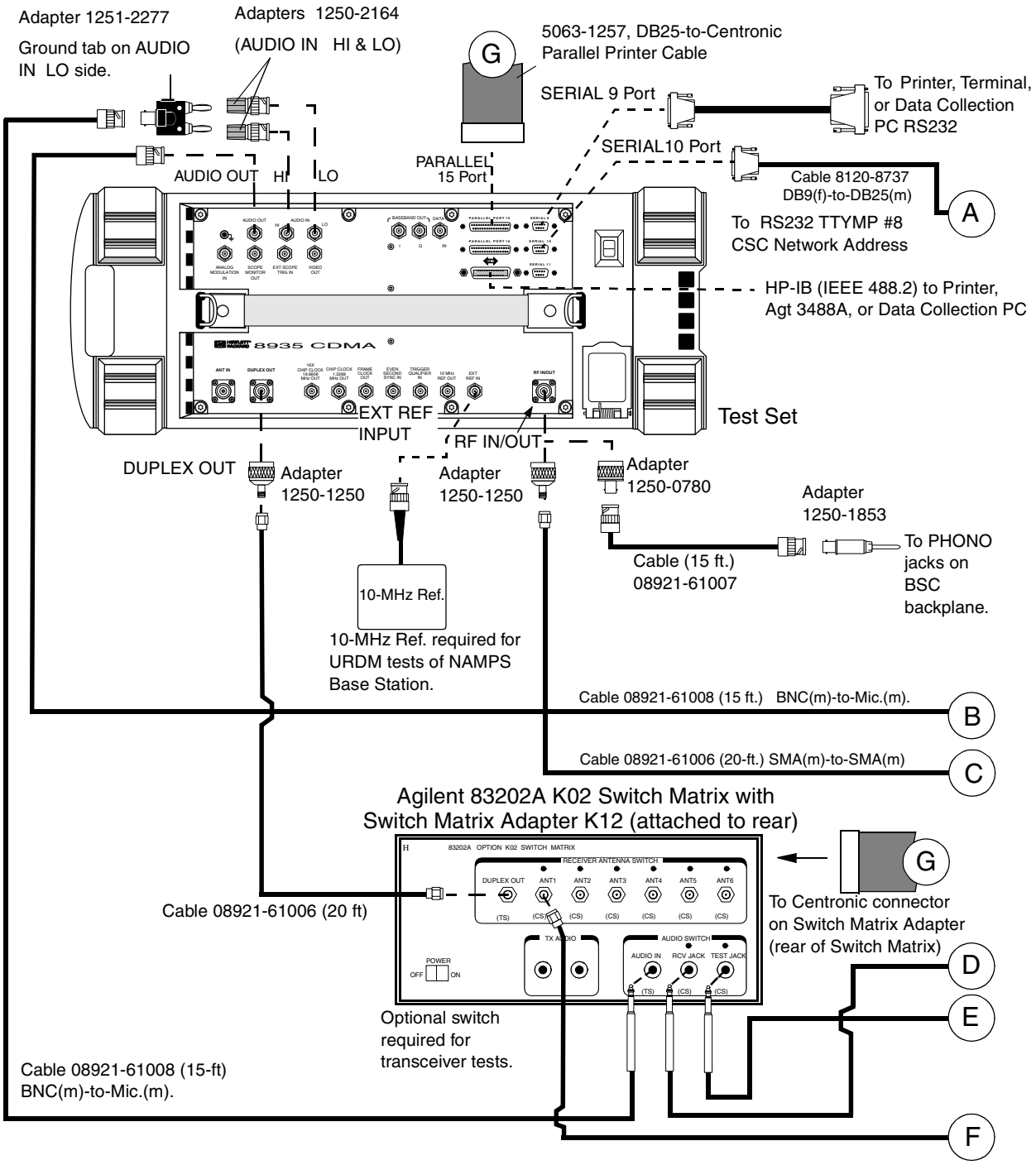
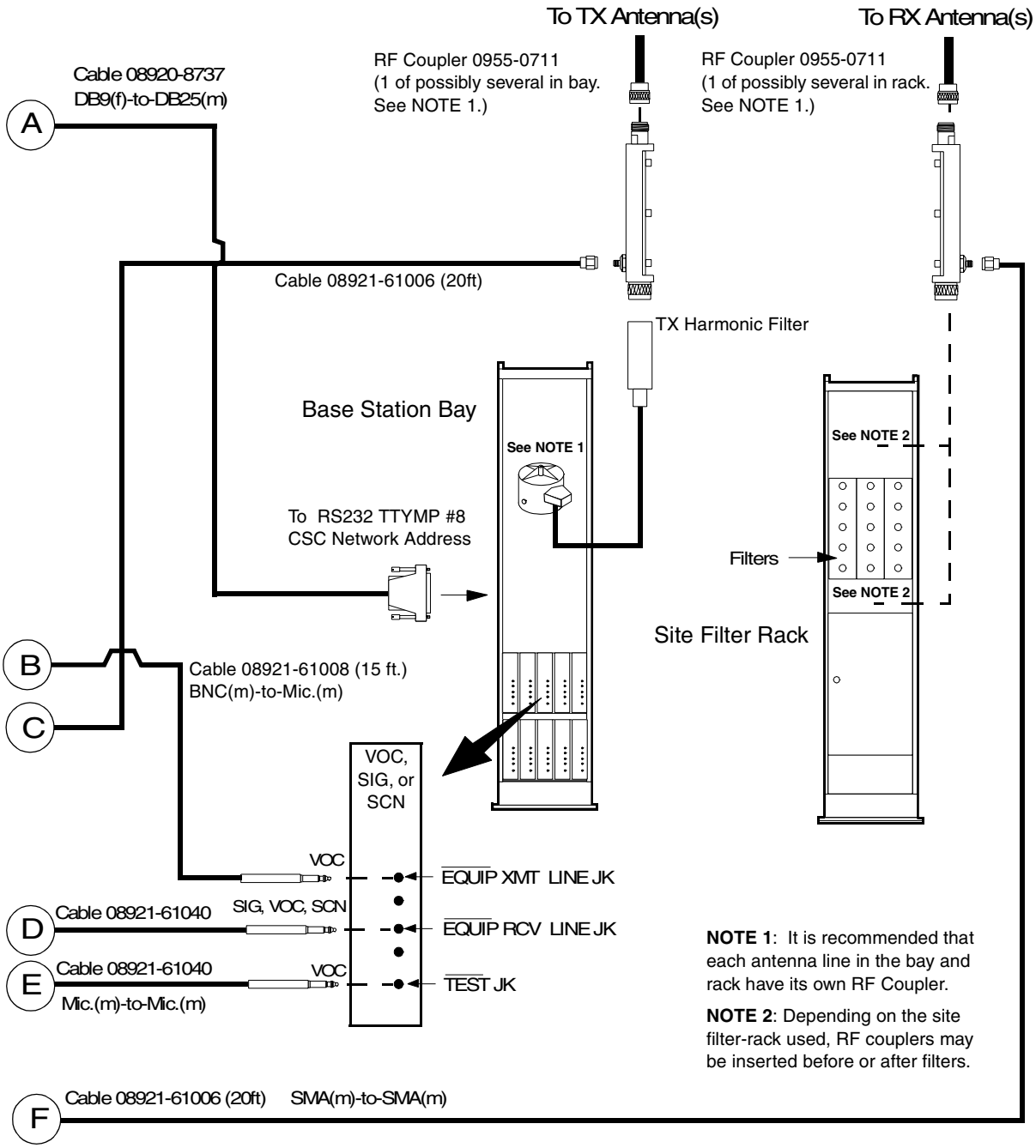


Figure 3-3 Connecting the Test Set to the Base Station (Part 2)



Receiver RF

An RF coupler must be installed between each of the receive antennas and Base Station receiver inputs (see Figure 3-2 and Figure 3-3). RF cables connect each of the coupled ports to an Switch Matrix or Splitter. The Switch Matrix will have two selected ports if the site is an omni site, or six if it is a sectored site. The common port of the Switch Matrix or Splitter is connected to the Test Set DUPLEX OUT connector. See “Switch Matrix or Splitter” on page 85 for details.

CAUTION The application of RF power greater than approximately 60 milliwatts might damage the Test Set DUPLEX OUT port. Never apply signals greater than 60 milliwatts. As an extra safeguard, the Test Set includes an over-power relay in the port circuit. If an RF signal greater than approximately 60 milliwatts is inadvertently applied, this relay will trip. To reset this relay, remove the problem signal, and press the **Shift** key, then the **Hold** (**Meas Reset**) key, or turn the Test Set power off and back on.

Signals that affect the equipment being measured can be picked up by the RX antennas. To prevent this, terminate the RF coupler when performing tests of the SIG unit and scan receivers. In measurements on voice channel receivers, antennas ordinarily may be left connected to the RF couplers. Interference may be detected by turning up the speaker volume of the Test Set. The interfering signal might be the result of a problem in the frequency plan. If it is impossible to proceed with measurements, terminate the RF coupler port leading to the antenna using a 50-ohm load.

Transmitter RF

An RF coupler must be installed between each cell site transmit antenna and its associated harmonic filter if you wish to perform any test in the In-Service Optimization state (see Figure 3-2 on page 44 and Figure 3-3 on page 45.) A small amount of power is available at the coupled port and is applied to the Test Set RF IN/OUT connector.

While testing the SIG unit, a high-power load must be placed on the RF coupler output to the antenna. It must be capable of handling at least 30 watts. The load is necessary to prevent the SIG unit transmitter signal from being radiated to mobile stations.

Audio

An SPDT switch must be installed so that the Test Software can automatically apply either the TEST JK of the transmitter or the EQUIP RCV of the receiver to the Test Set AUDIO IN connector (see Figure 3-2 on page 44 and Figure 3-3 on page 45.

The transmitter EQUIP LINE JACK is connected to the Test Set AUDIO OUT connector with a coaxial cable. You might wish to route this connection through the Switch Matrix.

RS-232 Control

The Test Software supports RS-232 control of the Base Station via the TTYMP #8 CSC Network Address connection (see Figure 3-2 on page 44 and Figure 3-3 on page 45. Other connections are not supported. Two Test Set DB9 connectors (SERIAL 9 and SERIAL 10) are used for serial communication. The SERIAL 9 port is used for data communication and the SERIAL 10 port is used for Base Station control and messaging.

Included with the Test Software is the BTS Laptop Utility program, which provides for simple and quick connection to a PC for data collection from the SERIAL 9 port.

PC and Printer Connections

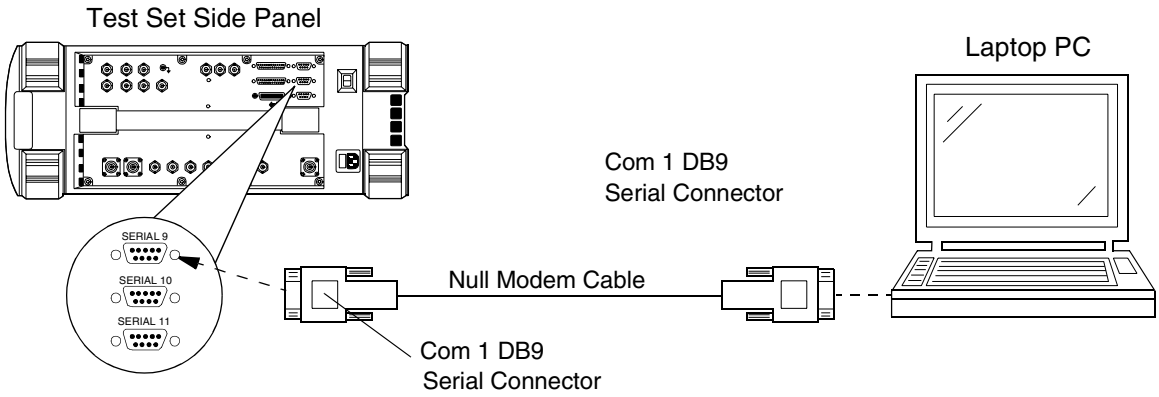
This section provides information on PC and printer connections for data collecting and recording.

PC

NOTE The Test Software includes the capability to transfer test results to an external PC. This may be done quickly and easily by running the BTS Laptop Utility program on a laptop PC or other computer to save the information.

Connect the Test Set SERIAL 9 port to the PC serial port using a DB9 to DB9 null modem cable (see Figure 3-4).

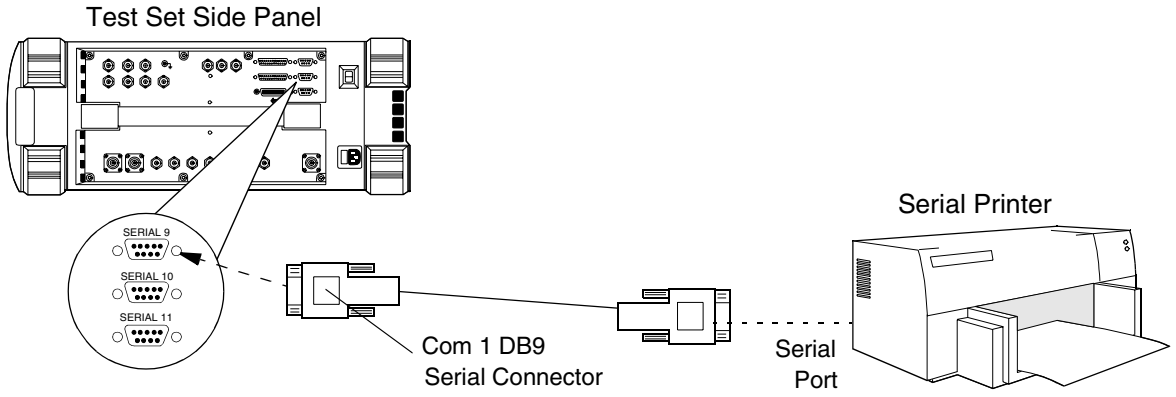
Figure 3-4 Test Set to PC Serial Connection



Serial Printer

Connect the Test Set SERIAL 9 port to the serial printer using a standard serial (DB9 to DB9) cable (see Figure 3-5).

Figure 3-5 Test Set to Serial Printer Connection

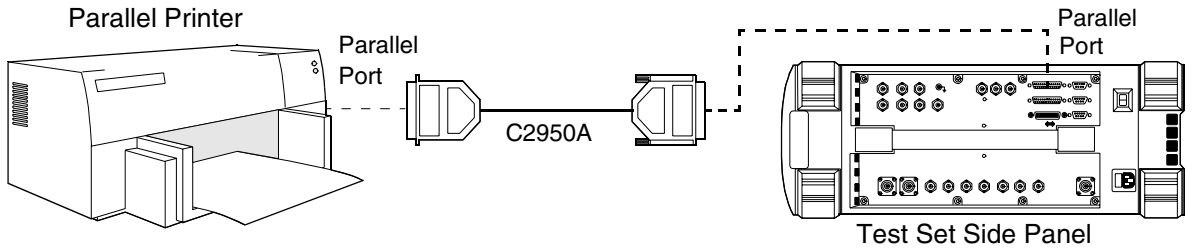


Parallel Printer

NOTE Because both devices receive information from the Test Set via the PARALLEL 15 port, it is not possible to use a parallel printer and a Switch Matrix at the same time. If the test plan requires printed results data, you must use either a serial or HP-IB printer of collect the data to a PC for later printing.

Connect the Test Set PARALLEL 15 port to the printer using a standard parallel printer cable (see Figure 3-6).

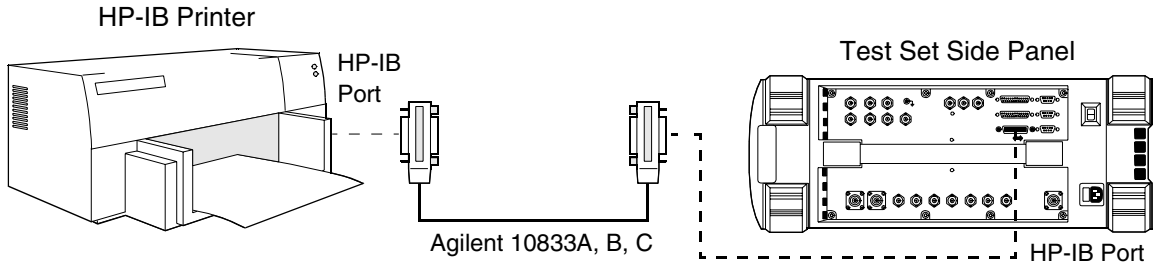
Figure 3-6 Test Set to Parallel Printer Connection



HP-IB Printer

Connect the Test Set HP-IB port to the printer using a standard HP-IB printer cable (see Figure 3-7).

Figure 3-7 Test Set to HP-IB Printer Connection



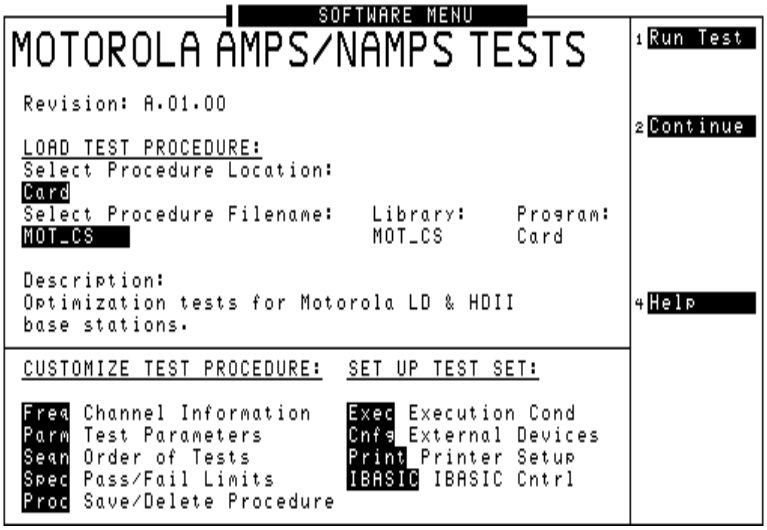
4 Reference

This chapter provides detailed descriptions of the general features and functions of the Test Software. Topics are arranged alphabetically for quick and easy reference.

Customizing Test Procedures

Customizing test procedures is accomplished from the SOFTWARE MENU screen (see Figure 4-1).

Figure 4-1 SOFTWARE MENU Screen



The fields listed under CUSTOMIZE TEST PROCEDURE: are used to customize the Test Software for various test requirements.

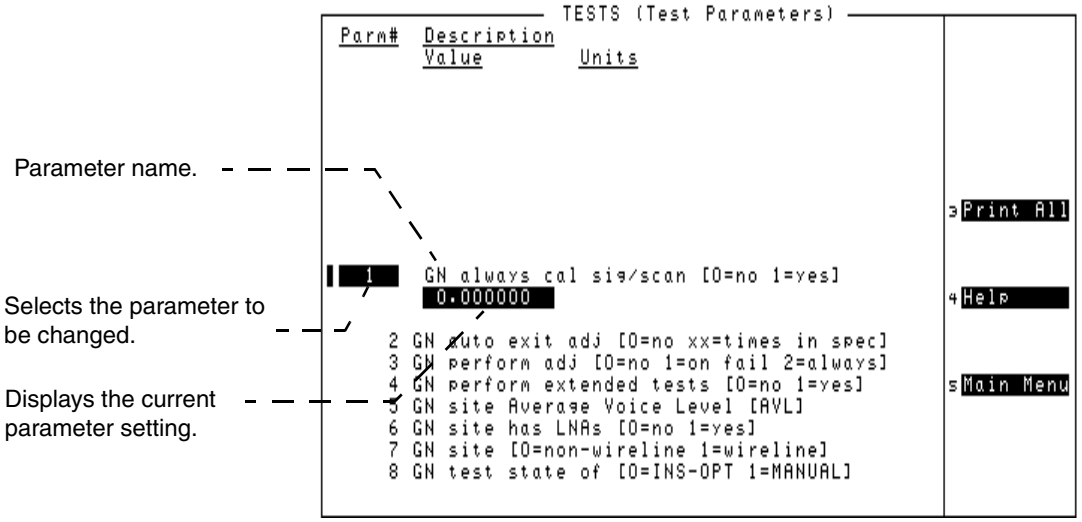
NOTE The Channel Information test function is not used by the Test Software. Instead, Base Station frequencies are coded into the Test Software, or are determined by messages sent by the Base Station to the Test Set. Entries made into the TESTS (Channel Information) screen will not affect the operation of the Test Software.

Test Procedures have been designed so that changes may be made easily from the Test Set front panel. For example, tests may be inserted or deleted and, later, after running the tests, you may change the pass/fail limits or test different channels. You may store the customized procedure on an SRAM card so that you may skip these steps in the future (“Saving/Deleting Procedures to/from a Card” on page 57).

Changing Test Parameters

Changing test parameters is accomplished from the TESTS (Test Parameters) screen (see Figure 4-2).

Figure 4-2 TESTS (Test Parameters) Screen


TESTS (Test Parameters)
Parm# Description
Value Units
Parameter name.
Selects the parameter to be changed.
Displays the current parameter setting.
1 GN always cal sig/scan [0=no 1=yes]
0.000000
2 GN auto exit adj [0=no xx=times in spec]
3 GN perform adj [0=no 1=on fail 2=always]
4 GN perform extended tests [0=no 1=yes]
5 GN site Average Voice Level [AVL]
6 GN site has LNAs [0=no 1=yes]
7 GN site [0=non-wireline 1=wireline]
8 GN test state of [0=INS-OPT 1=MANUAL]
3 Print All
4 Help
5 Main Menu

The Test Software uses parameters to optimize the test environment and conditions for the testing application. The default test parameters were determined by examining test requirements and specifications from the cell site equipment manufacturer. The Test Software comes with default settings for all test parameters.

The procedure shown in Figure 4-3 and Figure 4-4 describes the process for changing test parameters through the TESTS (Test Parameters) screen to optimize testing conditions. For information on saving customized test parameters, see “Saving/Deleting Procedures to/from a Card” on page 57 or “Saving/Deleting Procedures to/from Internal RAM” on page 61.

Figure 4-3 Changing Test Parameters

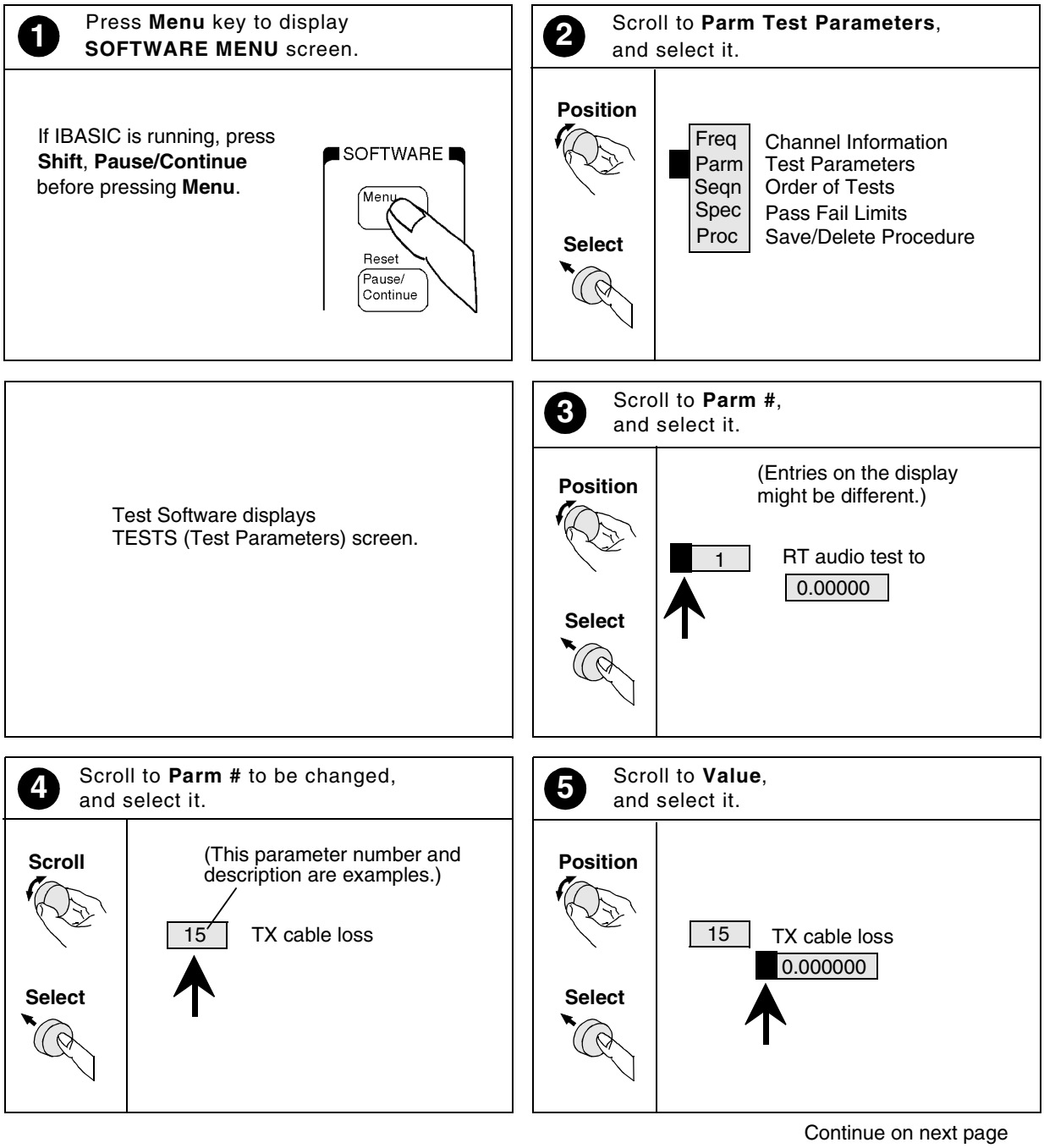


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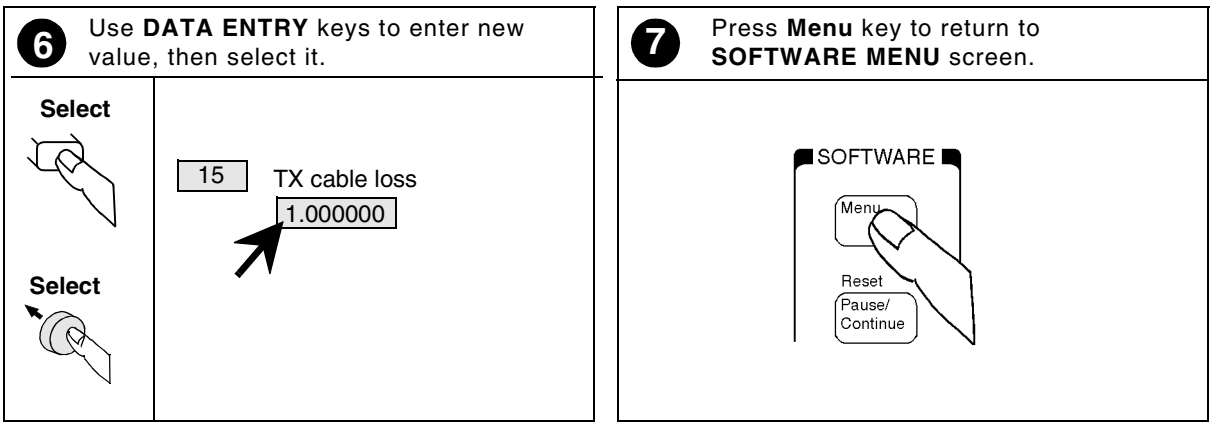
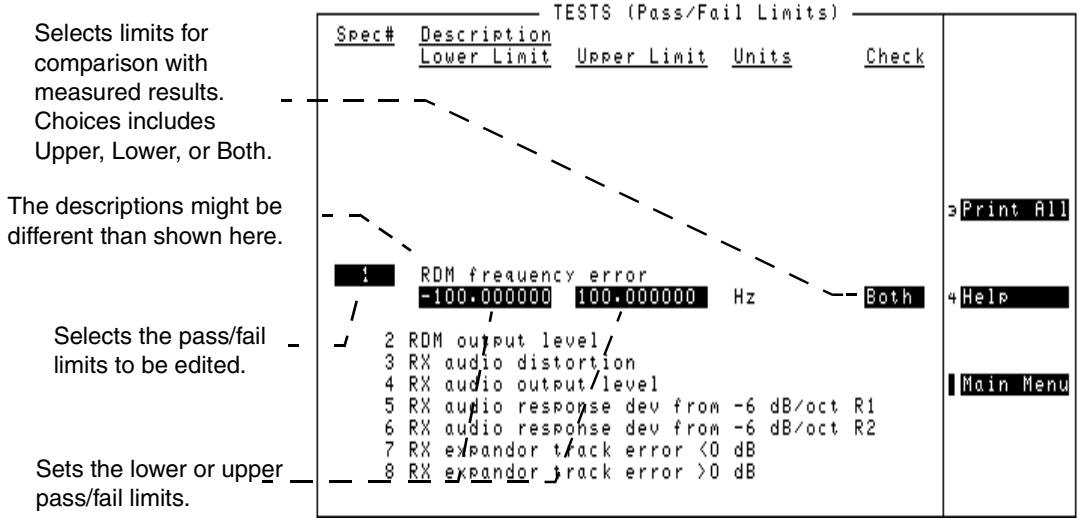
Figure 4-4 Changing Test Parameters (continued)



Changing Pass/Fail Limits

Changing pass/fail limits is accomplished from the TESTS (Pass/Fail Limits) screen (see Figure 4-5).

Figure 4-5 TESTS (Pass/Fail Limits) Screen


Selects limits for comparison with measured results. Choices includes Upper, Lower, or Both.
The descriptions might be different than shown here.
Selects the pass/fail limits to be edited.
Sets the lower or upper pass/fail limits.
TESTS (Pass/Fail Limits)
Spec# Description
Lower Limit Upper Limit Units Check
1 RDM frequency error
-100.000000 100.000000 Hz Both
2 RDM output level
3 RX audio distortion
4 RX audio output level
5 RX audio response dev from -6 dB/oct R1
6 RX audio response dev from -6 dB/oct R2
7 RX expandor track error <0 dB
8 RX expandor track error >0 dB
3 Print All
4 Help
Main Menu

Pass/Fail limits define the values a measurement result is compared against to determine if the system under test meets specified standards. Default values are set in the Test Software. These default values may be changed to meet the requirements of the particular application.

The procedure shown in Figure 4-6 and Figure 4-7 describes the process for changing pass/fail limits through the TESTS (Pass/Fail Limits) screen to optimize testing conditions. For information on saving customized pass/fail limits, see “Saving/Deleting Procedures to/from a Card” on page 57 or “Saving/Deleting Procedures to/from Internal RAM” on page 61.

Figure 4-6 Changing Pass/Fail Limits

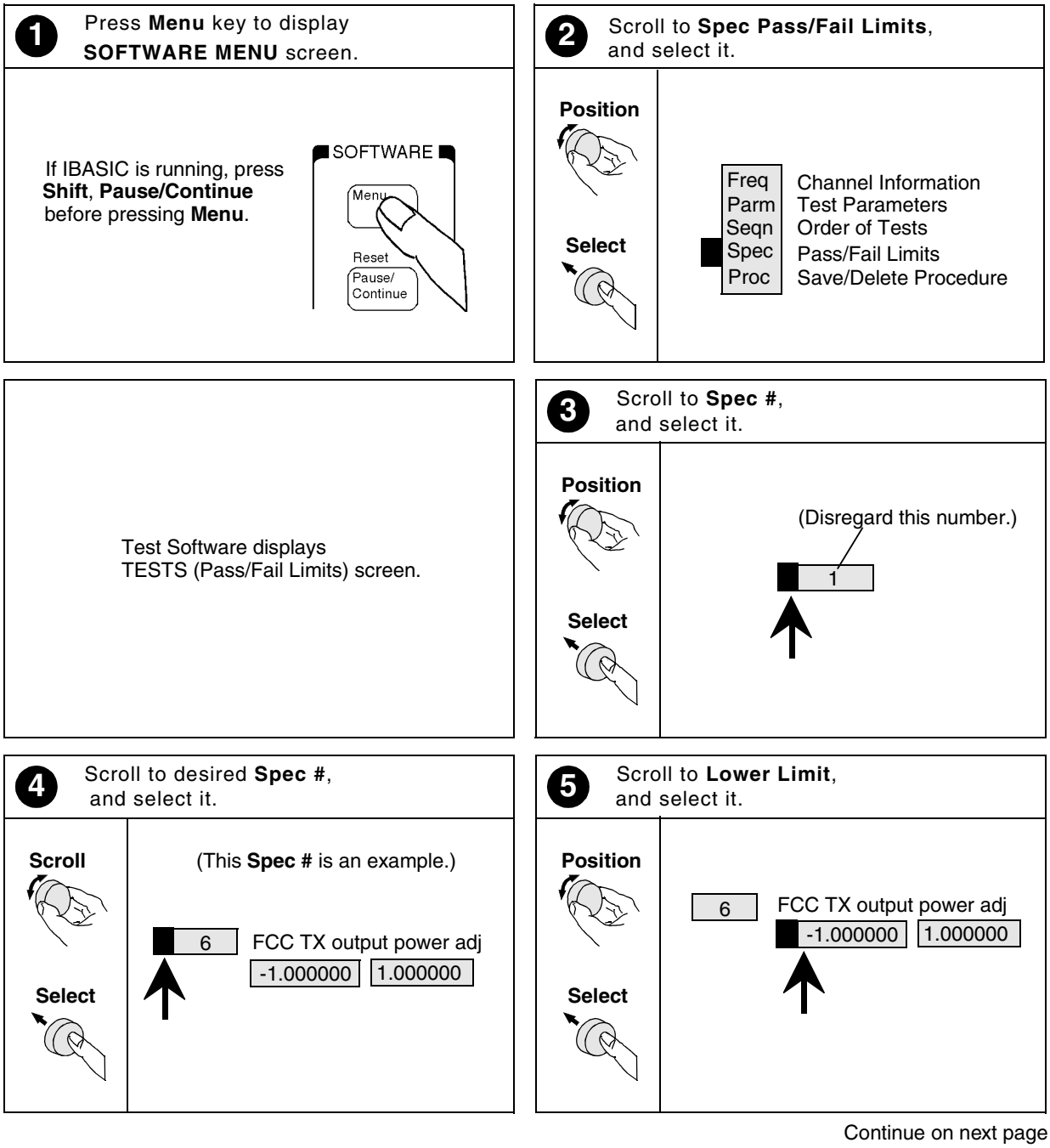


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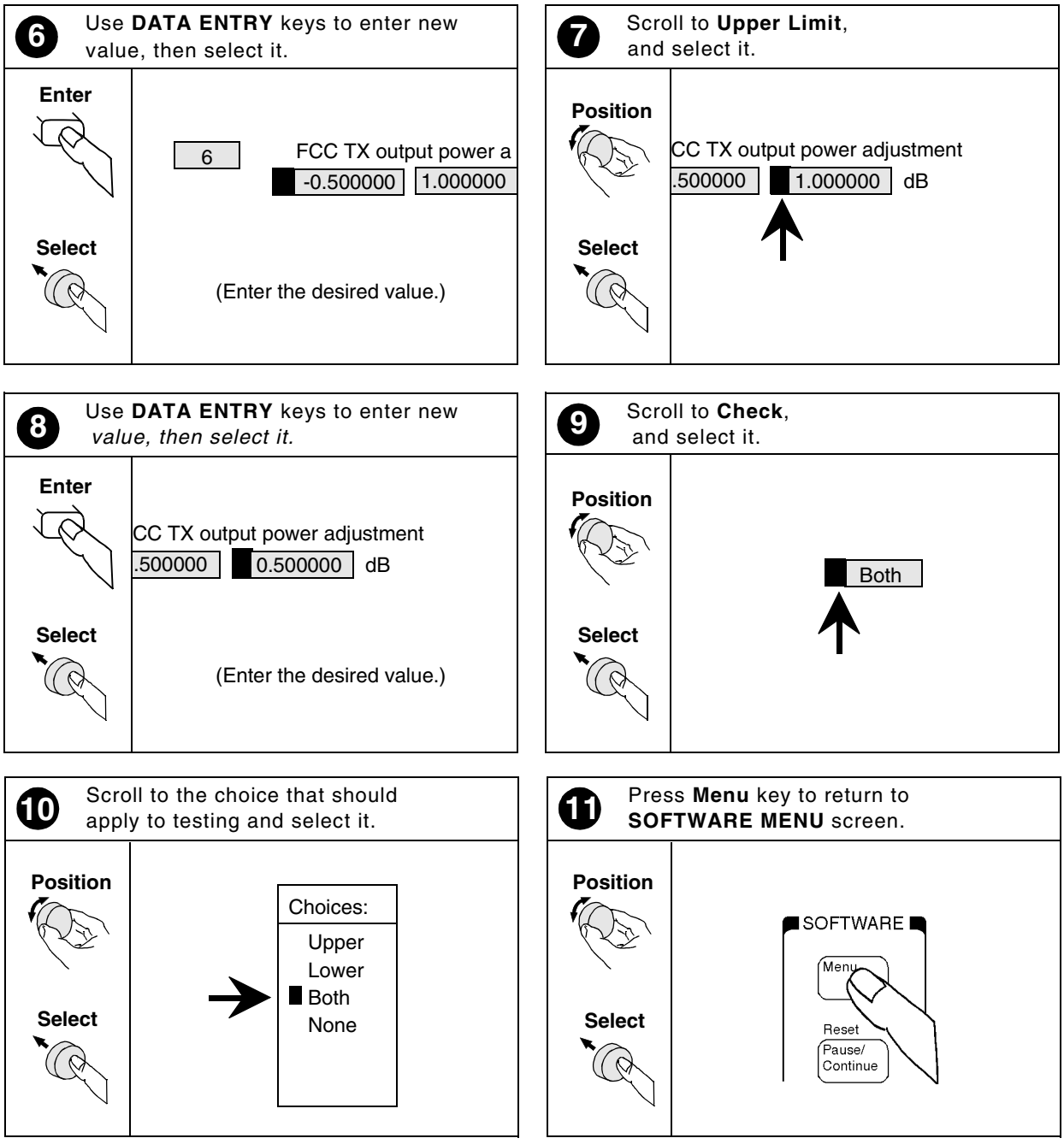
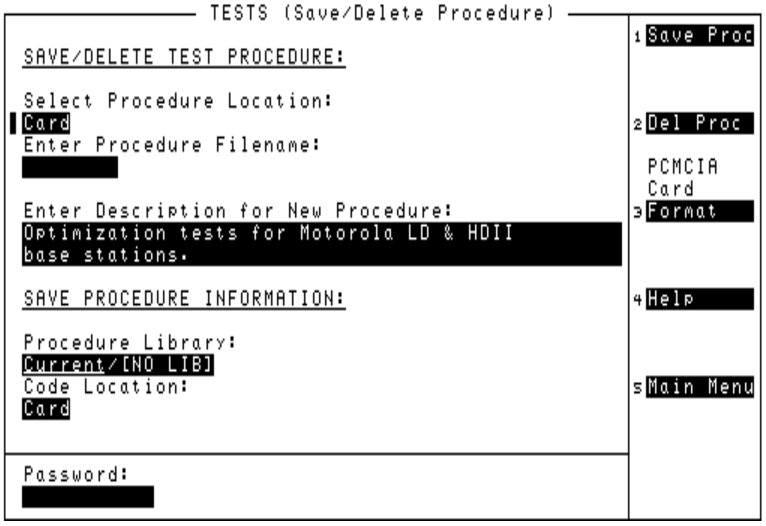
Figure 4-7 Changing Pass/Fail Limits (continued)



Saving/Deleting Procedures to/from a Card

Saving procedures to an SRAM card and deleting procedures from a card are accomplished from the TESTS (Save/Delete Procedure) screen (see Figure 4-8).

Figure 4-8 TESTS (Save/Delete Procedure) Screen



A test procedure is a collection of channel information, test parameters, testing order, and pass/fail limits saved in a file. This file might be one of the default procedures that is supplied on the Test Software PC card, or it might be an application specific procedure that customizes the Test Software to a specific application. Ordinarily, custom procedures are saved on an SRAM card.

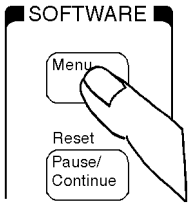
When you save a custom procedure, it consists of channel information, test parameters, pass/fail limits, and testing order, plus a library that contains the names of all test parameters, pass/fail limits, and tests that are resident in the Test Software. The library file comes from the Test Software and cannot be modified. The library file is saved automatically on the SRAM card that is used to store the new test procedure.

The procedure shown in Figure 4-9, Figure 4-10, and Figure 4-11 describes the process for saving a procedure through the TESTS (Save/Delete Procedure) screen. (Delete a procedure using the same process, except for step 13. To delete a procedure, select the **`Del Proc`** field or press the **`k2`** (**`Del Proc`**) key.)

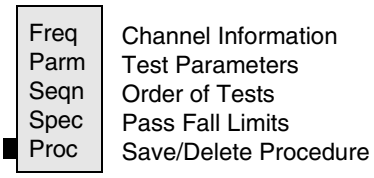
Figure 4-9 Saving/Deleting a Procedure

1 Press **Menu** key to display **SOFTWARE MENU** screen.

If IBASIC is running, press **Shift**, **Pause/Continue** before pressing **Menu.**

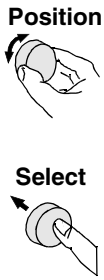


2 Scroll to **Proc Save/Delete Procedure**, and select it.

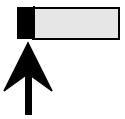


Test Software displays TESTS (Save/Delete Procedure) screen.

3 Scroll to **Select Procedure Location**, and select it.

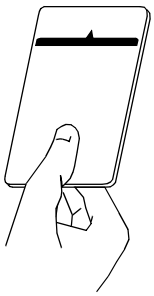


Select Procedure Location:

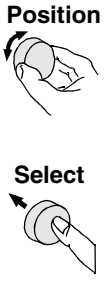


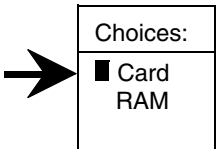
4 Insert initialized SRAM card.

For detailed SRAM card initialization instructions see “Initializing a PC Card” on page 78.



5 Scroll to **Card**, and select it.





(You may also save procedures to an internal RAM disk).

Continue on next page

Figure 4-10 Saving or Deleting a Procedure (continued)

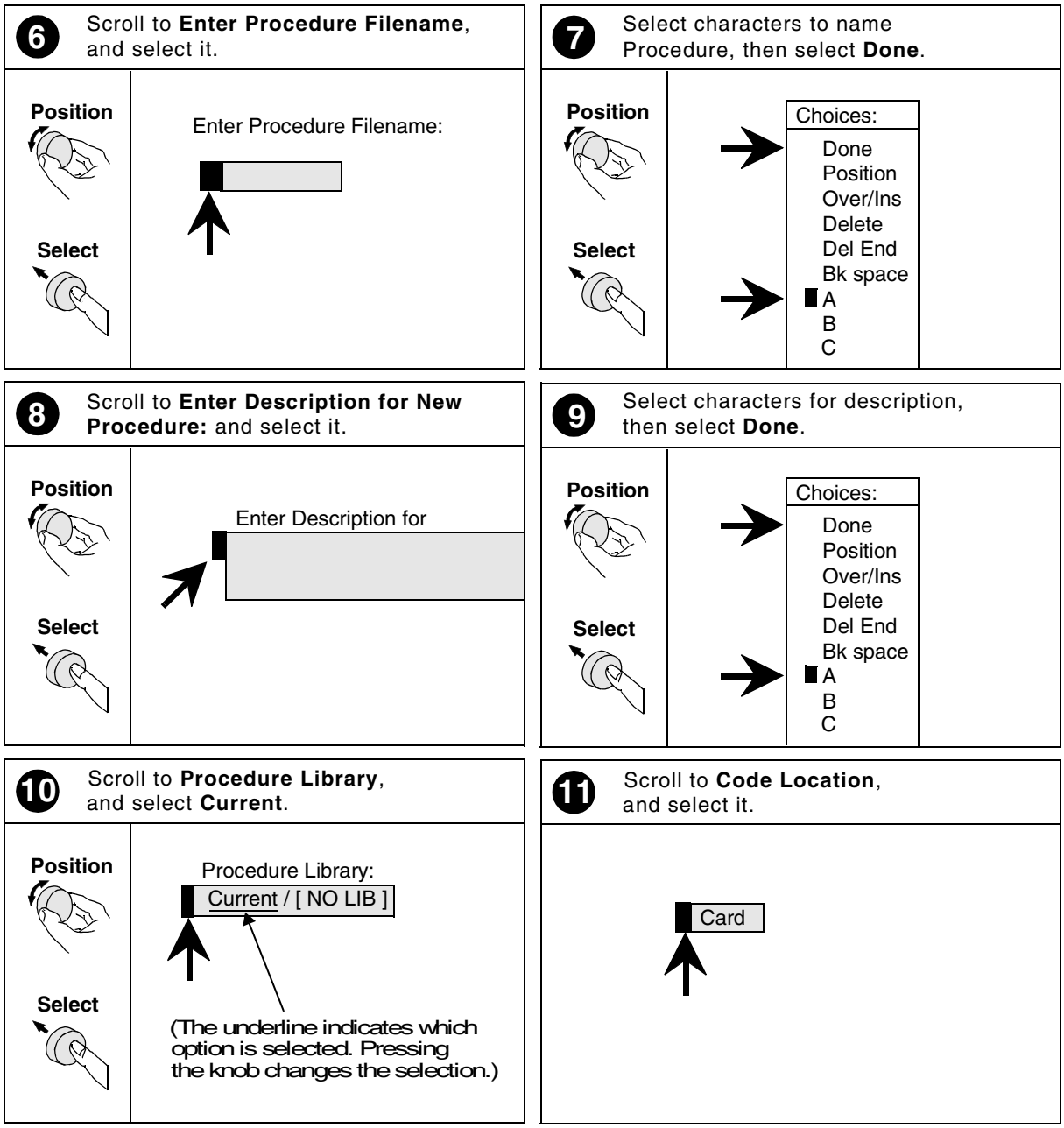


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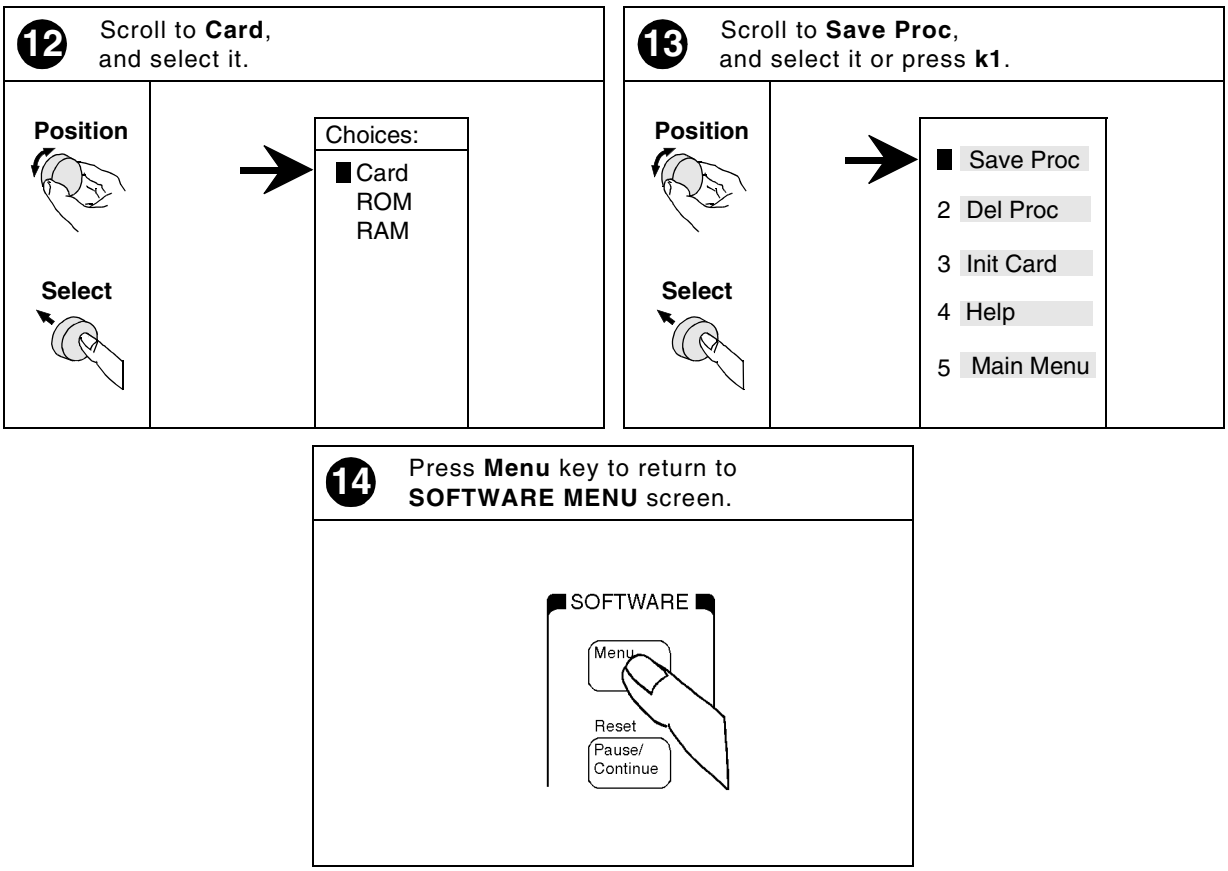
Figure 4-11 Saving or Deleting a Procedure (continued)



15 Run a saved procedure as follows:

1) Insert the SRAM Card with the saved procedure.

2) On the SOFTWARE MENU screen, a) select **Select Procedure Location:** then select Card, b) select **Select Procedure Filename:**, then select the saved file name.
3) Remove the SRAM Card, then insert the original Test Software PC card.
4) Press **Run Test**.

The original card contains the full program required to run the procedure.

Saving/Deleting Procedures to/from Internal RAM

Saving procedures to Test Set internal RAM and deleting procedures from internal RAM are accomplished from the TESTS (Save/Delete Procedures) screen (see Figure 4-8) such as shown in Figure 4-9, Figure 4-10, and Figure 4-11, except for the following:

- In Figure 4-9 step 4, initialize the RAM disk as outlined in "Initializing a RAM Disk" on page 77.
- In Figure 4-9, step 5, select **`RAM`** instead of **`Card`**.
- In Figure 4-11, step 15, sub-step 1 is not applicable.
- In step 15, sub-step 2, select **`RAM`** instead of **`Card`**.
- In step 15, sub-step 3, if the Test Software PC card is not inserted in the Test Set front panel card slot, do so.

Handling Test Results

It is often desirable to record test results for future reference or evaluation. The Test Software provides the capability to save test results to a variety of destination devices. These are:

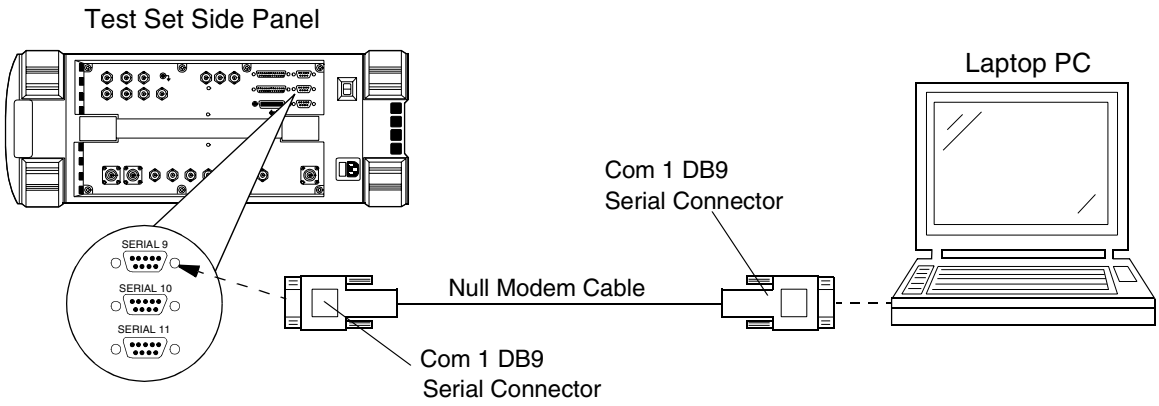
- A PC
- An SRAM card
- A serial printer
- A parallel printer
- An HP-IB printer

The capability to save test results remains on until you turn it off.

Sending Test Results to a PC Using the BTS Laptop Utility Program

Test results may be supplied directly to a PC through the Test Set SERIAL 9 port (see Figure 4-12) using a laptop PC running the Agilent Technologies BTS Laptop Utility program.

Figure 4-12 Test Set to PC Serial Connection



The requirements to save test results to a PC are as follows:

- The Test Set SERIAL 9 port must be connected to the PC using a null modem cable.
- The configured BTS Laptop Utility program must be running on the PC.
- The **`Use BTS Laptop Utility`** field in the Test Results/Laptop Util/Printer/Serial Setup menu screen must be set to **`Yes`**.
- The Test Set SERIAL 9 port communication parameters must be configured to match the communication parameters of the PC.

Configuring the PC Terminal Program.

Sending test results to a PC requires starting the BTS Laptop Utility program on the PC, then setting the Test Software to use the utility.

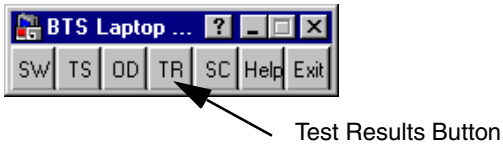
Perform the setup as follows:

Step 1. From the PC, start the BTS Laptop Utility program (see Figure 4-13).

Figure 4-13 Starting the BTS Laptop Utility Program

Step 2. On the PC screen, click on the **TR** button to display the window in which the test results will be displayed (see Figure 4-14).

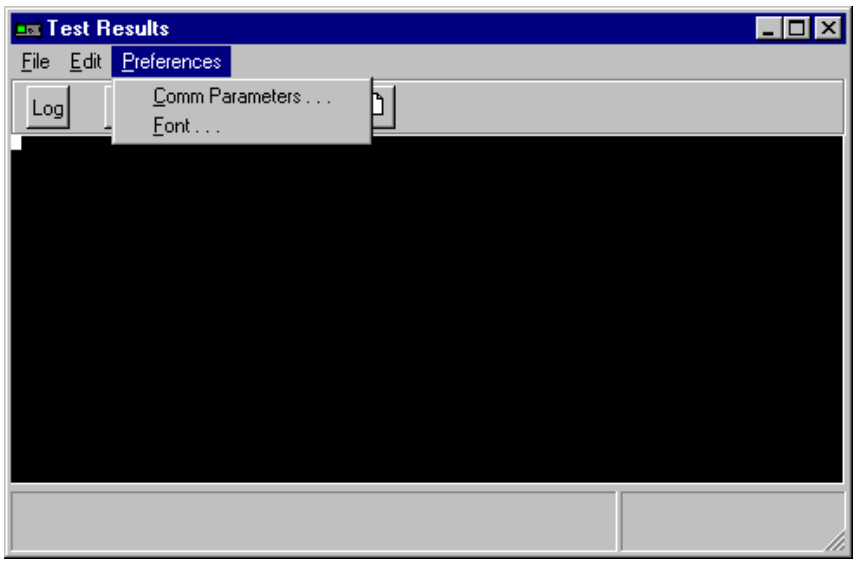
Figure 4-14 Selecting the Test Results Window



NOTE The Test Software does not use communication with the Switch for testing purposes. Thus, you might find it advantageous to turn off the **SW** button in the BTS Laptop Utility program window. To do this, select the **File Properties** window in the utility, then add -No Switch at the end of the **Shortcut Tab** in the **Target** field.

Step 3. On the PC screen, click on the **Preferences** field, then click on the **Comm Parameters** field to display the Comm Port Setup screen (see Figure 4-15).

Figure 4-15 Comm Port Setup



Step 4. On the Comm Port Screen, set the Test Set port to the serial port to which the null modem cable is connected on the Test Set (SERIAL 9).

Step 5. On the Comm Port Setup screen, set the Test Set baud rate to match the baud rate of the Test Set.

NOTE If the rate is higher than 19200 baud, the Test Set serial port flow control must be set to hardware.

Step 6. On the Comm Port Setup screen, set the Switch Port to **`No Port`**.

NOTE The Test Software does not use communication with the Switch for testing. If you have already set the Shortcut Tab as shown in the note in step 2, step 6 will not be required. The **`No Port`** selection will not appear.

Step 7. On the Comm Port screen, click on the **`OK`** button.

Sending the Results

To send test results to a PC, you must enable sending test results within the Test Software. Do this as follows:

Step 1. Connect the PC to the Test Set SERIAL 9 port using a null modem cable.

Step 2. On the Test Set, press the **`Menu`** key. The Test Set will display the SOFTWARE MENU screen.

Step 3. On the Test Set, select the **`Run Test`** field or press the **`k1`** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 4. On the Test Set, select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 5. On the Test Set, select the **`BTS Laptop Utility`** field so that the choice field toggles to **`Yes`**.

NOTE If the Test Software does not change the field to **`Yes`**, see the BTS Laptop Utility program help tool for hardware flow control. Also, make certain that you have completed all steps of this procedure correctly.

Step 6. On the PC, start the BTS Laptop Utility program.

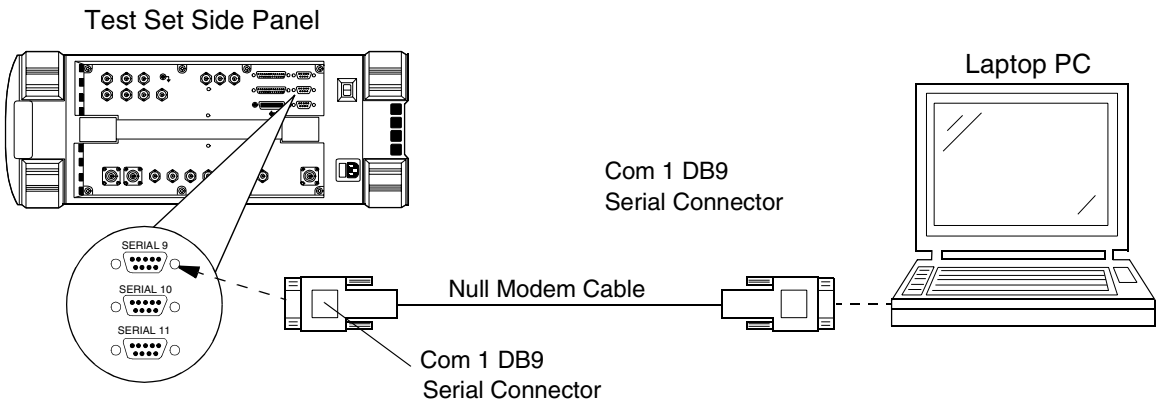
Step 7. On the Test Set, select the **`Serial 9 Port Settings`** field. Verify that the communication parameters match those of the BTS Laptop Utility program.

The Test Set will send test results to the PC using the BTS Laptop Utility program until you set the **`Use BTS Laptop Utility`** field to **`No`** in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to a PC

Test results may be supplied directly to a PC (with a communication program) through the Test Set SERIAL 9 port (see Figure 4-16). A variety of devices may be used to receive the data. An HP Palmtop computer, PC, laptop PC, or terminal may be used. A terminal emulator may be used to write the test results directly to a file. Examples of terminal emulator programs are HyperTerminal© and ProComm.

Figure 4-16 Test Set to PC Serial Connection



The requirements to save test results to a PC are as follows:

- The Test Set SERIAL 9 port must be connected to the PC.
- A configured terminal program must be running on the PC.
- The Send Test Results to Serial 9 function must be activated in the Test Software.
- The Test Set SERIAL 9 port communication parameters must be configured to match the communication parameters of the PC.

Configuring the PC Terminal Program

Sending test results to a PC requires that a configured terminal emulator be running while sending test results is enabled. See Figure 4-17 and Figure 4-18 for the detailed procedures required to configure a terminal program for saving test results to a PC.

Figure 4-17 Configuring a Terminal Program for Sending Test Results to a PC

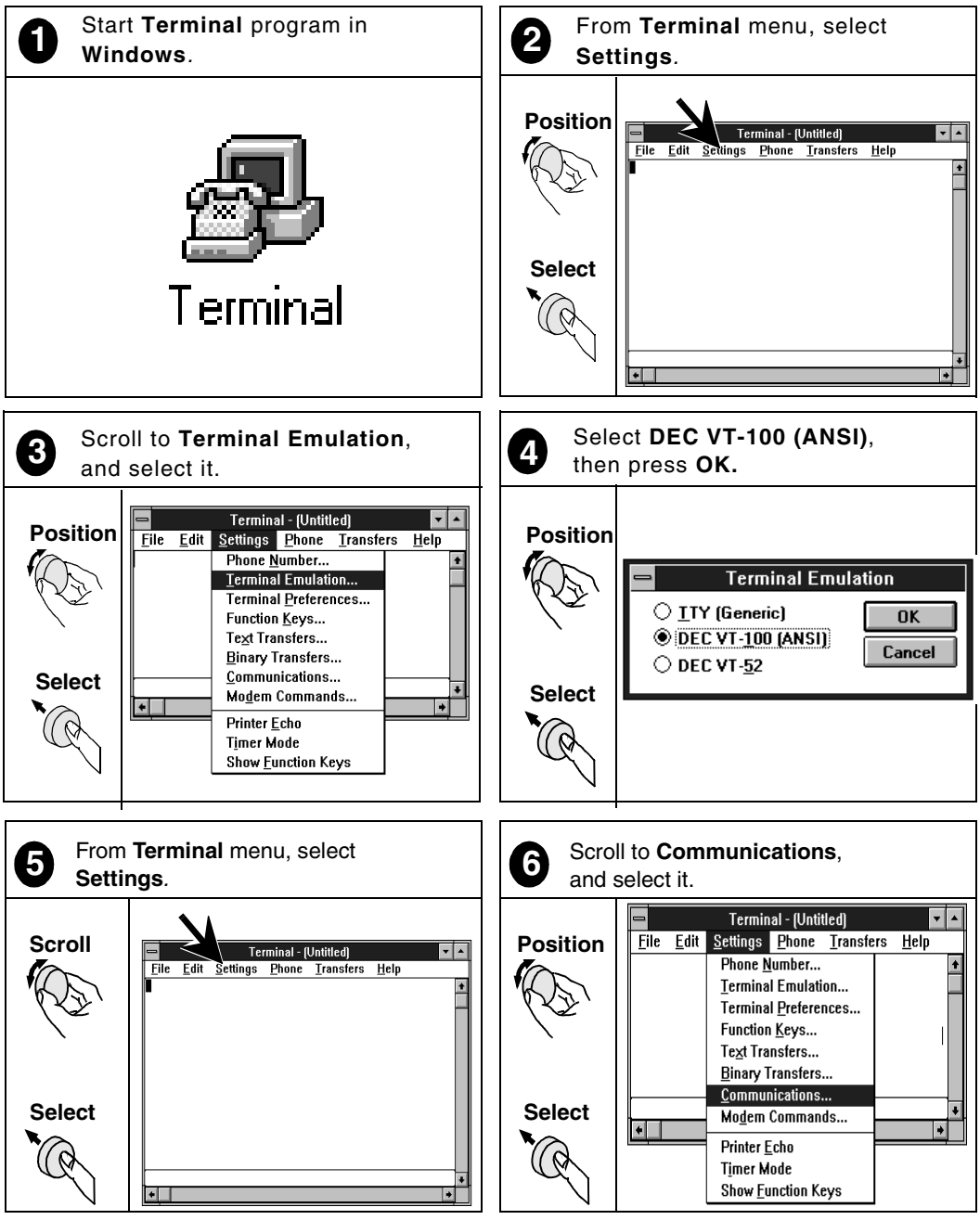
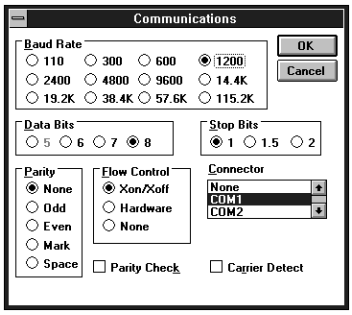


Figure 4-18 Configuring a Terminal Program for Sending Test Results to a PC (continued)

7 Edit menu to match Test Set settings on **IO CONFIG** screen.

Enter

Select



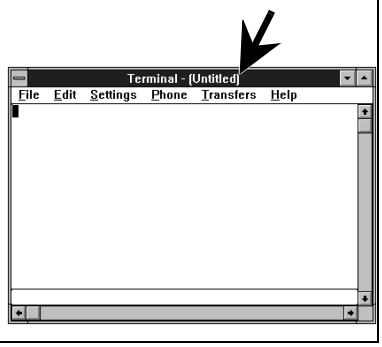
Example Communication Setup:

Connector: COM1 (Use appropriate settings.)
Baud Rate: 9600
Data Bits: 8
Parity: None
Flow Control: Xon/Xoff
Stop Bits: 1
Parity Check and Carrier Detect: both unchecked

8 From Terminal menu, select **Transfers**.

Enter

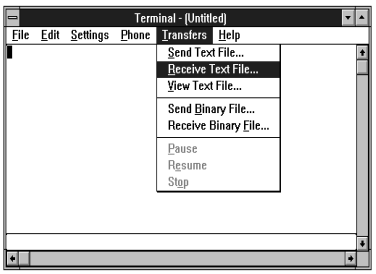
Select



9 Scroll to **Receive text file...** and select it.

Enter

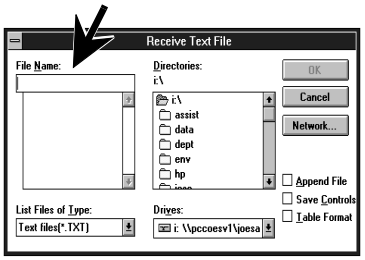
Select



10 Enter path and filename of file that you wish to save.

Enter

Select



After configuring the PC to receive the measured data, you must turn on Test Results in the Test Set and verify that the I/O Configuration screen communication parameters match those of the terminal program.

Sending the Results

To send test results to a PC, you must enable sending test results within the Test Software. Do this as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Verify that the **Use BTS Laptop Utility** field is toggled to **No**.

Step 5. Select the **Send Test Results to** field, then select **Serial 9** from the drop-down **Choices:** list.

Step 6. Start the terminal program.

Step 7. Select the **Serial 9 Port Settings** field. Verify that the communication parameters match those of the terminal program.

NOTE When you have configured the Test Set to send the data to a PC, you must remember to activate the communication package and specify a file in which to save the data. The Test Set will not issue an error message if the PC communication application is not running or configured properly.

The Test Set will send test results to the PC until you turn off the **Send Test Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to an SRAM Card

To send test results to an SRAM card, you must enable the Sending Test Results to a PC Card function within the Test Software. The Test Set will create test result files on the SRAM card automatically, based on the name that you enter at the start of testing. The Test Software will append ".txt" to the file name so that the files will be recognized on the SRAM card.

Once testing is complete and the test results are in files on the SRAM card, perform the procedure outlined in "Retrieving Data from an SRAM Card" on page 69 to transfer the data to a PC or printer.

NOTE Before attempting to send test results to an SRAM card, verify that the card is not write-protected. The write-protect switch should not be set toward the edge of the card.

Send test results to an SRAM card as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Insert an SRAM card into the front panel card slot. If the card has not been initialized, see "Initializing a PC Card" on page 78.

Step 5. Select the **Send Test Results to** field, then select **PC Card** from the drop-down **Choices:** list.

Step 6. The Test Set will display a message asking for a file name under which to store the test results. Enter a name using the characters from the **Choices:** list. Select **Done** when finished.

The Test Set will send test results to the SRAM card until you turn off the **Send Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

When the test is completed, the Test Set will close the file on the SRAM card and will change the **Send Test Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu screen from **PC Card** to **Off**. Thus, each time that you run the test and wish to record the results to the SRAM card, you must open the Test Results/Laptop Util/Printer/Serial Setup menu screen and enter a new file name as outlined above.

Retrieving Data from an SRAM Card

Use the software utility (FILE_XFER), which is included in the Test Set to transfer data files from the SRAM card to a serial printer, a parallel printer, an HP-IB printer, or a PC, via the serial port.

NOTE Loading and running the utility will replace any program in the Test Set memory. This means that you must reload the Test Software when the file transfer is complete. This requires that you have the Test Software PC card with you on-site.

Transferring Data to a Printer Via the Serial Port

Transfer data to a printer via the serial port as follows:

Step 1. If the Test Software is running, exit it from the Configuration Menu screen by pressing the **Shift** and **Pause/Continue** (**Reset**) keys, then the **k5** (**Main Menu**) key.

Step 2. Make certain that the serial printer is turned on and set up to print when the data are sent to the Test Set SERIAL 9 port.

Step 3. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 4. Select the **Select Procedure Location:** field. The Test Set will display a drop-down Choices: list containing the following items: **Card**, **ROM**, and **RAM**.

Step 5. From the **Choices:** menu, select **ROM**. This allows the loading of various utility programs resident in the Test Set.

NOTE In the following step, the items in the drop-down **Choices:** list are as shown on the printing date of this manual. However, this list could change in later version of the Test Software.

Step 6. Select the **Select Procedure Filename:** field. The Test Set will display a drop-down Choices: list containing the following items: **SERVICE4**, **RFTOOLS**, **IB_UTIL**, **LISTOPTS**, **ST_PLT**, and **DEMO**.

Step 7. From the **Choices:** list, select **IB_UTIL**.

Step 8. Run the utility software by pressing the **k1** (**Run Test**) key. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.

Step 9. Select the **FILE_XFER** field. The Test Set will display a prompt to insert the SRAM card that contains the test result files.

Step 10. Insert the card and select the **Continue** field. The Test Set will display the file transfer menu.

Step 11. Select the **Output Port** field and press the knob to select **Serial Port, 9600 baud**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

Step 12. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files might result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates true test result files.

Step 13. When all files to be transferred have been selected, select the **Start Transfer** field. The data will be sent to the printer via the serial port.

Step 14. When printing is complete, you may select other files to transfer or exit the software utility by selecting the **Exit Data-Collection-File-Transfer** field.

Step 15. To return to the Test Software again, press the **k1** (**Run Test**) key from the SOFTWARE MENU screen.

Transferring Data to a PC Via the Serial Port

Transfer data to a PC via the serial port as follows:

Step 1. If the Test Software is running, exit it from the Configuration Menu screen by pressing the **Shift** and **Pause/Continue** (**Reset**) keys, then the **k5** (**Main Menu**) key.

Step 2. Connect the Test Set to the PC using the SERIAL 9 port and a null modem cable.

Step 3. Load a PC software utility for communicating on the PC serial port such as HyperTerminal.

Step 4. Configure the PC software to prepare the PC to receive a text file via the serial port.

Step 5. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 6. Select the **Select Procedure Location:** field. The Test Set will display a drop-down Choices: list containing the following items: **Card**, **ROM**, and **RAM**.

Step 7. From the **Choices:** list, select **ROM**. This allows the loading of various utility programs resident in the Test Set.

Step 8. Select the **Select Procedure Filename:** field. The Test Set will display a drop-down Choices: list containing the following items: **SERVICE4**, **RFTOOLS**, **IB_UTIL**, **LISTOPTS**, **ST_PLT**, and **DEMO**.

Step 9. In the **Choices:** list, position the cursor at **IB_UTIL** and select it.

Step 10. Run the utility software by pressing the **k1** (**Run Test**) key. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.

Step 11. Select the **FILE_XFER** field. The Test Set will display a prompt to insert the SRAM card that contains the test result files.

Step 12. Insert the card and select the **Continue** field. The Test Set will display the file transfer menu.

Step 13. Select the **Output Port** field and press the knob to select **Serial Port, 9600 baud**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

Step 14. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files might result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates true test result files.

Step 15. When all files to be transferred have been selected, select the **Start Transfer** field. The data will be sent to the PC via the serial port.

Step 16. When data transfer is complete, you may select other files to transfer or exit the software utility by selecting the **Exit Data-Collection-File-Transfer** field.

Step 17. To return to the Test Software again, press the **k1** (**Run Test**) key from the SOFTWARE MENU screen.

Stop Sending Test Results to a PC or an SRAM Card

Stop sending test results to a PC or SRAM card as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **Send Test Results to** field, then select **Off** from the drop-down **Choices:** list.

Sending Test Results to a Serial Printer

Test results may be sent directly to a printer through the Test Set SERIAL 9 port. To do so, you must enable sending test results to the printer within the Test Software.

Send test results to a serial printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

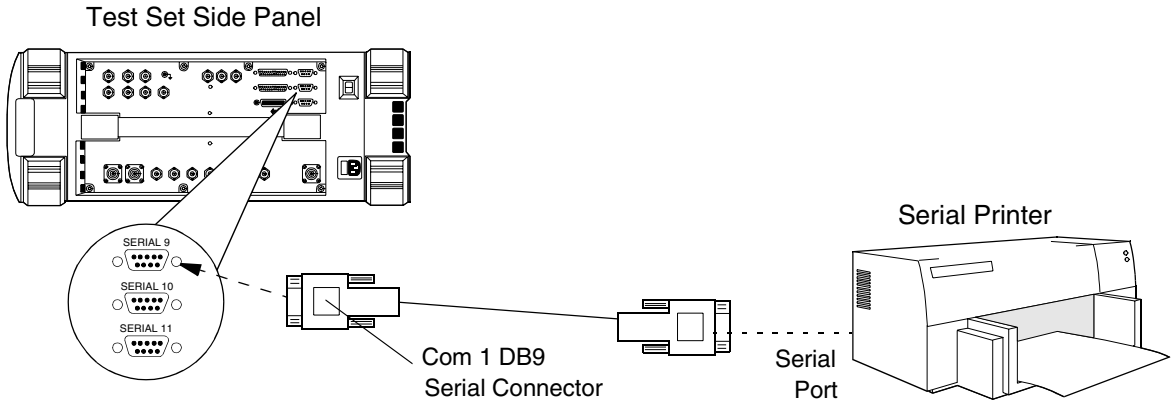
Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **Send Test Results to Printer at** field, then select **Serial 9** from the drop-down **Choices:** list.

Step 5. Connect the serial printer to port 9 on the Test Set (see Figure 4-19).

Figure 4-19 Test Set to Serial Printer Connection



Step 6. Select the **Print Setup** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/page
- Form feed (start and end)
- Printer model

The Test Set will send test results to the serial printer connected to port 9 until you turn off the **Send Test Results to Printer at** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to a Parallel Printer

Test results may be sent to a parallel printer through the Test Set PARALLEL 15 port. To do so, you must enable sending test results to the printer within the Test Software.

NOTE Because a parallel printer and an Agilent Technologies 83202A Switch Matrix both receive information from the Test Set via the PARALLEL 15 port, it is not possible to use the two devices at the same time. If the test plan requires both the Switch Matrix and printed test results data, you might use either a serial or an HP-IB printer, or collect the data to a PC for later printing.

Send test results to a parallel printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

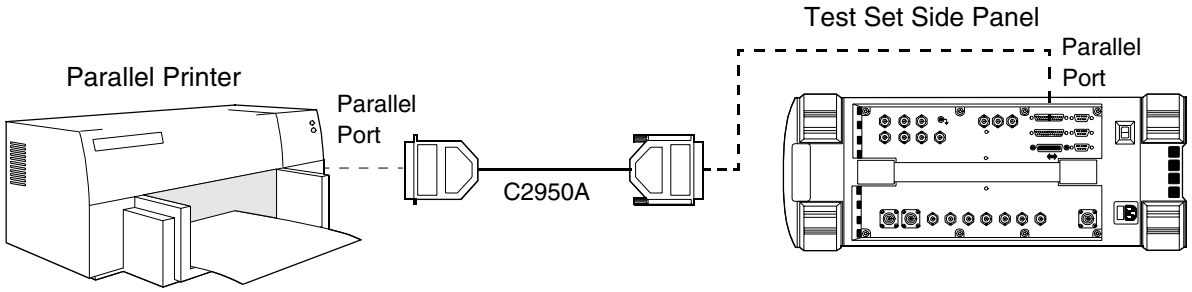
Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **Send Test Results to Printer at** field, then select **Parallel 15** from the drop-down **Choices:** list.

Step 5. Connect the parallel printer to the PARALLEL 15 port on the Test Set (see Figure 4-20).

Figure 4-20 Test Set to Parallel Printer Connection



Step 6. Select the **Print Setup** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/page
- Form feed (start and end)
- Printer model

The Test Set will send test results to the parallel printer connected to the PARALLEL 15 port until you turn off the Send Test Results to Printer at field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to an HP-IB Printer

Test results may be sent to an HP-IB printer through the Test Set HP-IB port. To do so, you must enable sending test results to the printer within the Test Software.

Send test results to an HP-IB printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

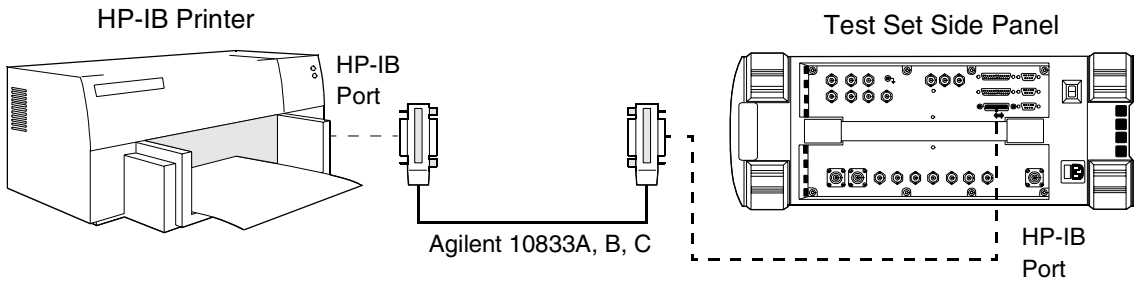
Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **Send Test Results to Printer at** field, then select **HP-IB 701** from the drop-down **Choices:** list. Edit the three-digit HP-IB address (the default is 701) in the address field at the right of **HP-IB**.

Step 5. Connect the HP-IB printer to the HP-IB port on the Test Set (see Figure 4-21).

Figure 4-21 Test Set to an HP-IB Printer Connection



Step 6. Select the **Print Setup** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/page
- Form feed (start and end)
- Printer model

The Test Set will send test results to the HP-IB printer connected to the HP-IB port until you turn off the Send Test Results to Printer at field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Stop Sending Test Results to a Printer

Stop sending test results to a printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Run Test** field or press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **Send Test Results to Printer at** field, then select **Off** from the drop-down **Choices:** list.

Initializing a RAM Disk

RAM disk is a section of Test Set internal memory that acts much like a flexible disk. Programs in this area of memory may be stored, re-stored, erased, and retrieved.

The RAM disk is partitioned into four separate volumes; 0-3. Each volume is treated as a separate 'disk'. You may also specify the size of each disk in 256-byte increments.

The four RAM disk volumes are designated **:MEMORY,0,0** to **:MEMORY,0,3**. For example, to catalogue the contents of RAM disk volume '0' from the **TESTS (IBASIC Controller)** screen, enter the following:

```
CAT ":MEMORY,0,0"
```

NOTE Any existing programs or formatting on RAM is erased if you use the **RAM_MANAGER** program to initialize a RAM disk. Therefore, you should use RAM disks only for short-term storage of files.

Each RAM disk volume must be initialized before it may be used. Volume 0 may be initialized using the RAM_MANAGER program from the **IB_UTIL** menu or from the TESTS (IBASIC Controller) screen. Volumes 1, 2, and 3 must be initialized from the TESTS (**IBASIC Controller)** screen.

NOTE Use only Volume 0 for storing procedures.

The optional 'volume size' in the following procedure allows you specify the memory area to be set aside for each disk in 256 byte blocks.

Initialize volumes 1, 2, or 3 as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **IBASIC IBASIC Cntrl** field from the **SET UP TEST SET:** list.

Step 3. Position the cursor to the data entry field at the top of the screen and select it.

Step 4. From the list of characters in the **Choices:** list, enter the following command:

```
INITIALIZE ":MEMORY,0,<volume number 1-3>",<volume size?
```

or

```
INITIALIZE ":MEMORY,0,1",50
```

Step 5. Press the **k1** (**Run**) key.

Initializing a PC Card

A new PC card or a card from which the battery has been removed and replaced must be initialized before it may be used. This section provides information on the initialization procedure.

Initialize a card as follows:

Step 1. Insert the card into the Test Set front panel card slot.

Step 2. Press the **Shift** key then the **Inst Config** key. The Test Software will display the I/O CONFIGURE screen.

Step 3. Select the **`Format Card`** field. The Test Software will display the message:

`Erase and format the PCMCIA Card? (YES/NO)`

Step 4. If you wish to format the card, press the **Yes On/Off** key in the DATA ENTRY section of the Test Set front panel. The Test Set will format the card. Formatting is complete when the cursor stops blinking.

If you do not wish to format the card, press the **No ppm W** key in the DATA ENTRY section of the Test Set front panel.

Operating the Test Set

This section provides information that will help you to operate the Test Set easily and efficiently. It includes a basic overview of the functions of groups of the more commonly used functions. It does not include detailed operation information on those functions. For detailed information on the operation of the display and the various keys and other controls, see the *Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set Reference Guide*.

NOTE Some Test Set front panel keys include a second title printed in blue above the key. This indicates a *shift* function. Press the blue **Shift** key, then the subject key to activate the title function. For instance, the title **Reset** appears above the **Pause/Continue** key. To reset the Test Software, press the **Shift** key, then the **Pause/Continue (Reset)** key.

SOFTWARE Keys

The SOFTWARE keys (see Figure 4-22), **Menu** and **Pause/Continue** (**Reset**), control the basic start/pause/stop functions of the Test Set and Test Software.

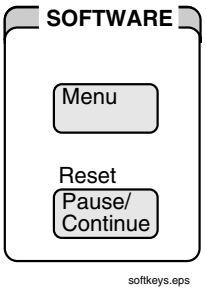
Press the **Menu** key to display the SOFTWARE MENU screen, which is the screen from which all Test Set operations start.

Press the **Pause/Continue** key to pause the Test Set or Test Software operation, then again to re-start the operation at the same place.

Press the **Shift** key, then the **Pause/Continue** (**Reset**) key to reset the Test Set or Test Software.

NOTE The Test Software cannot be "continued" after the **Shift** and **Pause/Continue** (**Reset**) keys have been pressed. Press these keys only if the Test Software must be stopped and pressing the **Pause/Continue** key does not do so.

Figure 4-22 SOFTWARE Keys



Screens

The various operation screens of the Test Software are accessible through several methods, as described in the following paragraphs.

Access the screens to modify test procedures from the **CUSTOMIZE TEST PROCEDURE:** list in the lower section of the SOFTWARE MENU screen. These screens are:

- TESTS (Channel Information) – Access this screen to verify or change the information in the frequency table.

NOTE The TESTS (Channel Information) screen is not used by the Test Software. Instead, Base Station frequencies are coded into the Test Software, or are determined by messages sent by the Base Station to the Test Set. Entries made in this screen will not affect the operation of the Test Software.

- TESTS (Test Parameters) – Access this screen to verify or change the values of parameters used in the TESTs.
- TESTS (Order of Tests) – Access this screen to verify or change the TESTs complement or order in which TESTs will be performed.
- TESTS (Pass/Fail Limits) – Access this screen to verify or change the values of pass/fail limits used in the TESTs.
- TESTS (Save/Delete Procedure) – Access this screen to save procedures to the Test Set internal RAM or an SRAM card, or delete procedures from those same locations.

For more information on these screens, see "Customizing Test Procedures" on page 50.

NOTE Three additional screens are ordinarily used to configure and set up the Test Set for operation from the **SET UP TEST SET:** list in the lower section of the SOFTWARE MENU screen. These screens are:

TESTS (Execution Conditions)
TESTS (External Devices)
and
TESTS (Printer Setup)

However, these screens are not used in the Test Software described in this manual. All relevant functions in these screens are set by other means, such as parameters, in the Test Software.

Access the Configuration Menu screen, from which all operations inside the Test Software are invoked, from the SOFTWARE MENU screen by selecting the **Run Test** field or pressing the **k1** (**Run Test**) key. For detailed information on this screen, see "Setting up the Test Software" on page 22.

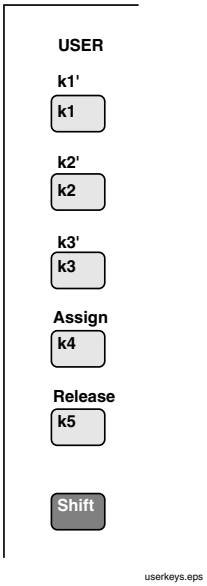
NOTE If you select the screen title bar at the top of the SOFTWARE MENU screen the Test Software will display a drop-down menu listing the ancillary operation screens. These screens are not used by the Test Software.

USER Keys

The five USER keys, **k1** through **k5** (see Figure 4-23), are programmable and control various functions according to current activities in the Test Software. The keys are listed along with the programmed functions in the right-hand section of appropriate screens. Only appropriate keys are shown in each screen instance. You may use these keys for more efficient operation instead of positioning the cursor to an item and pressing the knob.

NOTE Each USER key includes a second title printed in blue above the key. This *shift* functions are parts of the key programmability. However, currently, no USER key *shift* functions are used in the Test Software.

Figure 4-23 USER Keys

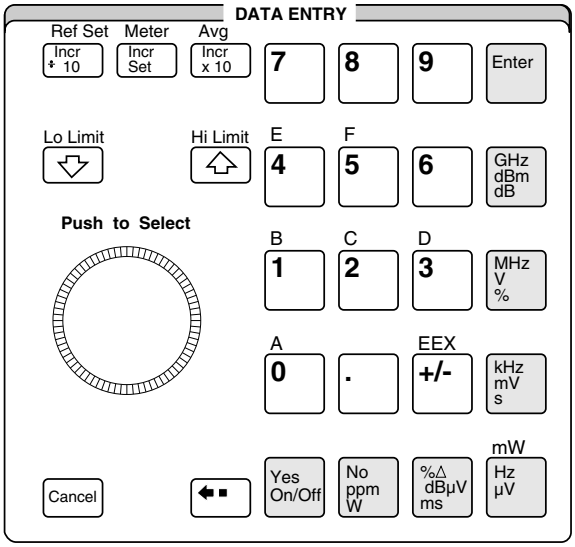


DATA ENTRY Keys

The DATA ENTRY keys include the **0** through **9** number keys plus the associated keys required for entering number values and the various characteristics of those values (see Figure 4-24). (Note that a number of the DATA ENTRY keys are *shift* keys.)

Although it is obviously not a key, the cursor control/entry knob is also located in the DATA ENTRY section of the Test Set front panel for convenience. Turn the knob to position the cursor, then press the knob to select the item indicated by the cursor.

Figure 4-24 DATA ENTRY Keys



datakeys.eps

GENERATOR/ANALYZER Keys

The GENERATOR/ANALYZER keys invoke the various testing tools, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

STATE Keys

The STATE keys allow user control over certain Test Set operational states, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

UTILS Keys

The UTILS keys provide the means to reach certain functions that control utilitarian aspects of Test Set operation, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results could occur.

Switch Matrix or Splitter

To reduce the number of cable connections and reduce the time required for measurements, you might elect to use any of three optional devices: a splitter, the Agilent Technologies 83202A Switch Matrix, or the Agilent Technologies 3488 Switch Matrix. Any of these may be used to connect to all six receiver antenna connectors at once. This section provides information on using the Switch Matrix or Splitter.

Using the Splitter

To use the Splitter, simply connect it as shown in Figure 3-1 on page 43, Figure 3-2 on page 44, and Figure 3-3 on page 45. All cables will remain connected during the test process. and all signals will be applied at all times.

Using the Agilent Technologies 83202A Switch Matrix

NOTE If you wish to use the Agilent Technologies 83202A Switch Matrix (Agilent Technologies Part Number: 83202A K02), make certain that you also have available the Switch Matrix Adapter (Agilent Technologies Part Number: 83202A K12) and the DB25-to-Centronics Control Cable (Part Number: C2951A) to allow the Test Set to control the Switch Matrix.

To use the Agilent Technologies 83202A Switch Matrix, connect the DB25-to-Centronics switch control cable (supplied with the Switch Matrix) between the Switch Matrix and the PARALLEL 15 port on the Test Set, and connect the Base Station cables as shown in Figure 3-1 on page 43, Figure 3-2 on page 44, and Figure 3-3 on page 45. All cables will remain connected during the test process. and the Test Software will switch the signals as required.

DC power must be supplied to the Switch Matrix. An AC-to-DC adapter supplied with the Switch Matrix converts the AC line voltage to the DC level (24 volts) required by the Switch Matrix. Plug the power cord into any standard AC power receptacle.

Using the Agilent Technologies 3488 Switch Matrix

To use the Agilent Technologies 3488 Switch Matrix, connect the HP-IB switch control cable (supplied with the Switch Matrix) between the Switch Matrix and the Test Set, and connect the Base Station cables as shown in Figure 3-1 on page 43, Figure 3-2 on page 44, and Figure 3-3 on page 45. All cables will remain connected during the test process. and the Test Software will switch the signals as required.

AC power must be supplied to the Switch Matrix. Plug the supplied power cord into any standard AC power receptacle.

Procedure for Using the Splitter or Switch Matrix

To use the Splitter or Switch Matrix, you must configure the Test Software to recognize the device. If you are using a Splitter, the connections remain fixed and the Test Software will handle the testing accordingly. If you are using a Switch Matrix, the Test Software will change the antenna connections automatically, as required during testing.

Configure the Test Software for operation with the Splitter or Switch Matrix as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Select Procedure Location:** field, then select **Card** from the drop-down **Choices:** list.

Step 3. Select the **Select Procedure Filename:** field and select the desired procedure.

Step 4. Select the **Run Test** field or press the **k1** (**Run Test**) key. The Test Software will display the Configuration Menu screen.

Step 5. Select the **External Switch Setup** field. The Test Software will display the External Switch Setup menu screen.

Step 6. Select the **Antenna Switch Control** field, then select the desired connection method from the drop-down **Choices:** list.

If you wish to use the Splitter, select the **Splitter** field, then select the **Return** field. The Test Software will display the Configuration Menu screen again so that you may run the test. Proceed to the next step.

If you wish to use the Agilent Technologies 83202A Switch Matrix, select the **83202A** field. The Test Software will display an information prompt that indicates the Switch Matrix setting and allows you to change it if you wish. Proceed to the next step.

If you wish to use the Agilent Technologies 3488 Switch Matrix, select the **3488 709** field, then insert the HP-IB address into the field immediately to the right. The Test Software will display a prompt regarding Test Set control. Follow the on-screen instructions. Proceed to the next step.

Step 7. Select the **Return** field. The Test Software will display the Configuration Menu screen again.

Step 8. Select the **Test Menu** field. The Test Software will display the Test Menu screen.

Step 9. Select a TEST. When the Test Software display the connection diagram for the Base Station hook-up, the diagram will include the Splitter or Switch Matrix hook-up.

Step 10. Follow the on-screen directions, then press the **k1** (**Proceed**) key to continue the test.

Securing/Un-Securing Procedures

This section describes the processes for securing and un-securing a procedure.

NOTE If a procedure is located in Test Set RAM, securing that procedure will result in initializing a section of the Test Set RAM. See "Initializing a RAM Disk" on page 77.

NOTE Loading an running the utility to perform these procedures will replace any program and procedures in the Test Set internal RAM. Thus, the Test Software must be reloaded when this procedure is complete. This requires that you have the Test Software PC card with you on-site.

Securing a Procedure

After you have set up the Test Software with a testing order, channel information, test parameters, and pass/fail limits, thereby creating a Procedure, you might wish to secure it. This will prevent the viewing and changing of those functions. In this process, you may select the items that you wish to secure. Use the IBASIC SECURE_IT program in the Test Set ROM to do this.

You might wish to secure the Procedure that is supplied with the Test Software. It is shipped un-secured.

Secure a Procedure as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Select Procedure Location:** field.

Step 3. From the drop-down **Choices:** list, select **ROM**.

Step 4. Select the **Select Procedure Filename:** field.

Step 5. From the drop-down **Choices:** list, select **IB_UTIL**.

Step 6. Press the **k1** (**Run Test**) key. The Test Set will display the IB_UTIL menu screen.

Step 7. Select the **SECURE_IT** field. The Test Set will display a menu containing two possible locations (**Card** or **RAM**).

Step 8. Select the location of the Procedure that you wish to secure.

NOTE RAM refers to the RAM disk memory within the Test Set. Before selecting RAM, you must initialize the RAM as a disk. See "Initializing a RAM Disk" on page 77.

Step 9. Proceed with the on-line instructions. You might wish to secure only one of the items, such as pass/fail limits.

Step 10. When prompted to enter the **pass number**, enter any sequence of 9 or less numerals using the DATA keypad. The numerals may be 0 through 9 in any order.

Un-Securing a Procedure

After you have secured a Procedure, you may un-secure it. In this process, you may select the items that you wish to un-secure. Use the IBASIC SECURE_IT program in the Test Set ROM to do this. To un-secure a procedure, you must know the **pass number**.

Un-secure a procedure as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **Select Procedure Location:** field.

Step 3. From the drop-down **Choices:** list, select **ROM**.

Step 4. Select the **Select Procedure Filename:** field.

Step 5. From the drop-down **Choices:** list, select **IB_UTIL**.

Step 6. Press the **k1** (**Run Test**) key. The Test Set will display the IB_UTIL menu screen.

Step 7. Select the **SECURE_IT** field. The Test Set will display a menu containing two possible locations (**Card** or **RAM**).

Step 8. Select the location of the Procedure that you wish to un-secure.

Step 9. Enter the name of the procedure that you wish to un-secure.

NOTE If the procedure includes any item that is secured, you will be prompted for the **pass number**.

Step 10. Proceed with the on-line instructions. Select the items that you wish to un-secure.

Step 11. When prompted, enter the **pass number** using the DATA keypad.

Utilities

The Agilent Technologies E8303A Motorola AMPS/NAMPS Cell Site Test Software contains utilities that are useful to both general testing and advanced testing operations. These utilities are described in this section.

Cable Cal

The accuracy of RF power measurements and receiver sensitivity measurements are affected by the losses in cables, RF switches, attenuators, and other such items that connect the transceiver and the test set. The cable cal test allows the Test Set to measure and store the loss associated with the cables and other devices to be used during testing. The Test Set thus can provide greater accuracy by accounting for these losses in the tests that are performed later.

If changes to cable or other device loss information is required, measure such losses as follows:

Step 1. On the Configuration Menu screen, select the **`Cable Cal`** field. The Test Software will display a cable connection diagram.

NOTE In the measurement process, you will require a cable, or perhaps two cables, to connect the device to be measured to the Test Set. This cable (or cables) is (are) referred to as the calibration cable. The Test Software must have the loss value for the cable(s) so as to be able to measure accurately the device to be measured. Thus, the calibration cable loss is measured in the next step.

Step 2. Connect the calibration cable as shown on the diagram, then press the **`k1`** (**`Proceed`**) key. The Test Software will measure the calibration cable, then display a second cable connection diagram that includes the addition of a cable to be tested.

NOTE The second connection diagram depicts a cable as the device to be measured. Although a cable is the most common device to be measured, there are other devices that you might wish to measure. These include switches (including the Switch Matrix), attenuators, and such. Each device may be measured individually, or, for instance, if a cable and switch are to be used together, those items may be connected together and the Test Software will measure the loss value through the combination. You may then save that value in the appropriate field.

Step 3. Connect the cable or other device to be measured to the calibration cable and the Test Set as shown on the diagram, then press the **`k1`** (**`Proceed`**) key. The Test Software will measure the loss of the cable or other device and display the Cable Loss (dB) menu. The loss will be displayed near the top of the menu.

Step 4. Select the relevant cable location among the fields shown below the value and press the knob to save the value. If the same value is applicable to other fields, repeat this step for each of those.

Step 5. To test another cable or other device, select the **`Repeat or Test next cable`** field from the menu and repeat steps 3 and 4. Continue until all cables and devices are measured and all values are saved.

Step 6. Select the **Return** field or press the **k5** (**Return**) key to return to the Configuration Menu screen.

The cable loss values stored during this test may be changed at the start of any procedure.

Laptop Emulator

The Laptop Emulator utility provides for sending individual control commands to the Cell Site Base Station. Using the Laptop Emulator Mode, the Test Software will send the selected commands through the RS232 interface, then display the responses from the Base Station. This utility may be accessed also by the **Laptop** user key when a failure causes the test to stop (if the Test Set is set to **Stop** on fail mode, see "PARAMETER_04 GN perform extended tests [0=no 1=yes]" on page 126.

Invoke the Laptop Emulator mode as follows:

Step 1. On the Configuration Menu screen, select the **Test Menu** field. The Test Software will display the Test Menu screen.

Step 2. On the Test Menu screen, select the **TEST_08 Manual Switch & Calibration Aid** field. The Test Software will display the Manual Switch and Calibration Aid screen.

Step 3. Select the **Go to the Laptop screen** field. The Test Software will invoke the Laptop Emulator Mode and display the Terminal Emulator Mode screen.

The Terminal Emulator Mode screen includes the complete list of commands, and the status of each. Turn the knob to move the cursor arrow up and down the list. Note that the list of commands extends beyond the bottom of the screen. Dependent upon the cursor position, press either the **k3** (**Page Up**) key or the **k4** (**Page Down**) key to display more commands. Press the knob to select the command indicated by the cursor arrow. Press the **k5** (**Return**) key, then the **k2** (**No**) key to return to the Utility Screen. Select the **Return** field or press the **k5** (**Return**) key to return to the Initialization Screen.

In some instances, the Test Software will display a drop-down list from which you may select. In other instances, the command will toggle.

If you change a parameter in the Base Station using the Laptop Emulator Mode, the Test Software will not restore that parameter before testing starts. Therefore, you must restore the Base Station to its original state if you wish to continue testing.

If an "error" response appears in a STATUS field, this indicates a communication problem with the Base Station. Try sending the command again. If this does not work, you might have to turn off a previous command, such as TX data. Refer to the Motorola manual for a description of the commands. If everything else fails, the communication link with the Base Station might be locked. In such case, turn the Base Station off, then back on, and run the test again.

RF Tools

For information on using the RF Tools Utilities, see the *Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set Reference Guide*.

5 Test, Parameter, and Pass/Fail Limits Descriptions

This chapter describes each of the USER key functions, then describes each test, associated parameter, and associated pass/fail limits.

USER Keys

In running TEST_01 through TEST_11, the Test Software will assign, at various times, the following functions to USER keys **k1** through **k5**. These functions are assigned upon appropriate use, as indicated in the upper right-hand area of the Test Set display. USER keys are sometimes referred to as “softkeys”.

All Cal

Press this key to cause the Test Software to download scan receiver calibration data.

Clr Scr

Press this key to clear the Test Set display.

Proceed

NOTE At various times, the Test Software will enter a loop and wait for you to either enter a new value or accept a default value.

Press this key after you have entered a new value or when you wish to accept the default value shown on the screen.

Del Chan

Press this key to delete all voice channel controllers and voice channels not being tested. (This key appears only in TEST_03 and only in manual mode. See “TEST_03 - Voice Transceiver” on page 103.)

Delet Stp

Press this key to delete TESTs during the editing of items in a TEST sequence. (When you press this key, the TEST in the displayed sequence with the **Step #** highlighted will be deleted. The TESTs that follow in the sequence will be scrolled up by one step.)

Disp Data

Press this key to change the display of cable fault data from graphic form to tabular form.

Done

Press this key to exit a TEST or when a task is completed. (The program will continue if there is a next TEST in the sequence or if there are additional program steps in the TEST being run.)

HDII Loc

LD Loc

NAMPS Loc

Press one of these keys to display graphically on the Test Set display the location of the indicated adjustment.

Insrt Stp

Press this key to copy new items into a TEST sequence. (When you press this key, the TEST in the displayed sequence with the **Step #** highlighted will be copied into a new sequence location, immediately after the highlighted one. The TESTs that follow in the sequence will be scrolled down by one step. This key does nothing if there are no items in the sequence. Select a TEST before using this key to insert another.)

Key/Dekey

Press this key to turn the RF power of the transmitter on and off. (When a TX power test starts, you must press this key. If an output power adjustment cannot be made with the power amplifier installed, de-key the transmitter before you remove it. Key the transmitter after you have reinstalled the power amplifier.)

Laptop

Press this key to exit the TEST to send commands to the Base Station. (Selecting **Done** on the Laptop Emulator screen causes the program to continue execution from the exit point.)

LNA Offs

Press this key to determine the low noise amplifier offsets and to correct any that is not set according to PARAMETER_06 GN site has LNAs [0=no 1=yes]. (This key appears only in TEST_04 and TEST_05. See “TEST_04 - Signaling Transceiver MANUAL Mode” on page 108 and “TEST_05 - Scanning Transceiver MANUAL Mode” on page 112.)

Next Wind

Press this key to move the cursor from its present window to another window. (The cursor may be used to change test conditions and send commands in different windows. For instance, in “TEST_10 - Voice Channel Manual Test Mode” on page 121, several windows are displayed on the Test Set display. The cursor will not move to a window unless a change is permitted in that window.)

Next Chan

Press this key to select the next channel in the scan receiver channel list. (This key appears at times in “TEST_10 - Voice Channel Manual Test Mode” on page 121. After you have selected the **Tune test set** field from the list in the **Measure** window, use this key to change the channel displayed above the parameters window. The **Tune test set** field is provided in this TEST so that you may use a laptop PC to check, manually, such messages as the RSSI of a scan receiver.)

Next Ant

Press this key to select the next antenna. (This key appears at times in "TEST_10 - Voice Channel Manual Test Mode" on page 121. After you have selected the **Tune test set** field from the list in the **Measure** window, use this key to change the antenna displayed above the parameters window. The **Tune test set** field is provided in this TEST so that you may use a laptop PC to check manually such messages as the RSSI of a scan receiver.)

Page Up
Page Down

Press these keys to move a selection list up and down in the Test Set display. (These keys are used to display items when the entire list will not fit on the screen.)

Prev Ant

Press this key to select the previous antenna. (This key appears at times in "TEST_10 - Voice Channel Manual Test Mode" on page 121. After you have selected the **Tune test set** field from the list in the **Measure** window, use this key to change the antenna displayed above the parameters window. The **Tune test set** field is provided in this TEST so that you may use a laptop PC to check manually such messages as the RSSI of a scan receiver.)

Prev Chan

Press this key to select the previous channel. (This key appears at times in "TEST_10 - Voice Channel Manual Test Mode" on page 121. After you have selected the **Tune test set** field from the list in the **Measure** window, use this key to change the antenna displayed above the parameters window. The **Tune test set** field is provided in this TEST so that you may use a laptop PC to check manually such messages as the RSSI of a scan receiver.)

Print All

Press this key to print the parameters, pass/fail limits, configuration, and sequence that you have entered into the TESTS sub-screens. (The SERIAL 9 port or the HP-IB port may be used.)

Prt Full

Press this key to expand the display of the Base Station messages. (See "TEST_01 - Laptop Emulator" on page 98.)

Re-test

Press this key to re-display the connection diagram so that another test may be started. (This key appears after a cable fault test has been performed.)

Run

Press this key to start an IBASIC program that has been loaded into the Test Set memory.

Run Test

Press this key to load and run the program that results from the Procedure that has been entered into the TESTS (Main Menu) screen **Select Procedure Filename:** field. (If the Test Software is already loaded into Test Set memory, it will be started.)

Send ESC

Press this key to cause the Test Set to send an escape command to the Base Station. (This will terminate the display of information and messages from the Base Station. This key appears while TEST_01 is running. See "TEST_01 - Laptop Emulator" on page 98.)

Send FREE

Press this key to cause the Test Set to send a FREE command to the Base Station, so that a call is moved from a channel to be tested. (This key is used to free a channel before making a measurement of wide band data deviation on an active channel. A USE command must be sent after a FREE command. See "TEST_07 - Wideband Data on an Active Voice Channel" on page 117.)

Send TM

Press this key to cause the Test Set to send to the Base Station a command that will result in a wideband data message being transmitted on a voice channel. (TX frequency deviation is measured while the message is being sent. See "TEST_07 - Wideband Data on an Active Voice Channel" on page 117.)

Send USE

Press this key to cause the Test Set to send a USE command to the Base Station so that a channel will be assigned to the next origination, handoff, or page operation. (This key must be pressed while originating a call before making a measurement of wideband data deviation on an active channel. See "TEST_07 - Wideband Data on an Active Voice Channel" on page 117.)

Show Log

Press this key to display a log of recent Base Station commands and messages that have been sent or received. (This key appears at times while TEST_10 is running. This key will appear only when the cursor is in the **BS commands sent** window. See "TEST_10 - Voice Channel Manual Test Mode" on page 121.)

Skip Sens
Skip SAT
Next Ant
Skp N SSI

Press these keys to cause the Test Software to skip over the indicated measurements in a scan receiver test. (These keys appear when "PARAMETER_24 SC skip items in scan test [0=no 1=yes]" on page 128 is set to 1. The **N** in **Skp N SSI** refers to the antenna being tested.)

Sngl Step

Press this key to step the IBASIC program one line at a time. (This is different from **Continuous/Single Step** run mode.)

Stop Test

Press this key to pause the Test Software operation.

Tns off
Tns quiet
Tns loud

Press these keys to set the volume of tones that provide aural feedback during testing.

To Chan

Press this key to display a channel list so that a new channel may be selected.

Yes, No

Press these keys as responses when answering prompts displayed on the Test Set screen.

Zoom

Press this key to expand the display of a measurement while "TEST_10 - Voice Channel Manual Test Mode" on page 121 is running.

-60 dBm
-90 dBm
-100 dBm

Press these keys to set the RF generator to the level at which the calibration is performed. (These keys appear during the calibration of LD SIG units and LD scan receivers.)

Test Descriptions

Each test is a series of measurements. One test or more may constitute a procedure. While you may change the tests that make up a procedure, you may not change the measurements that the test will perform. Generally, the order in which the tests are run is not important.

The first two to four letters in the name of each parameter or pass/fail limit indicate the classification of the item. The classifications are:

- **GN** – General
- **RDM** – Reference Distribution Module
- **RX** – Receiver
- **RX/TX** – Receiver/Transmitter
- **TX** – Transmitter
- **SC** – Scan
- **ZZZZ** – Demo Mode

TEST_01 - Laptop Emulator

This TEST allows you to send commands to the Base Station, and view messages sent from the Base Station by emulating the capabilities of a portable computer.

CAUTION Commands that you send might have a profound effect on the operation of the cell site. Be certain of the effect of the command selection before you send it to the Base Station.

You might wish to place TEST_01 immediately before one or more TESTs that require the system to be taken out of service. You may use this TEST to send the MANUAL command to the Base Station.

Sending Commands

The column on the left side of the TEST_01 screen contains commands that may be selected and transmitted to the Base Station. Response messages are displayed in a window on the right-hand side of the screen. Move the cursor to the command that you wish to send to the Base Station, then press the knob to send it.

The Base Station generally echoes commands sent to it.

The **k2** (**Page Up**) key allows you to display quickly commands that might have scrolled off the top of the display. The **k4** (**Page Down**) key allows you to view commands that have scrolled down.

Some of the commands require that entries be made. For example, after you select the command **Delete VCC**, the following question prompt will be displayed:

```
Enter the VCC# [0-7]?
```

Verify that the cursor is in the upper left-hand corner of the large field in the upper part of the display. Then, use the knob or the DATA ENTRY keys to enter a value. Select **Done** to complete the entry.

If you wish to send a command that is not in the list provided in the Test Software, you may use the **Enter Command** selection. An alternative is to use the PC/Modem mode (see "Using the PC/Modem Mode" on page 99). In some versions of Base Station firmware, the command syntax includes parameters that are not programmed into the commands in TEST_01. Examples are those that use NAMPS parameters. Determine the syntax and send these commands using the **Enter Command** selection.

The Base Station commands are described in the Main Monitor Commands section of the Motorola Base Station Instruction Manual.

As an example of command selections, assume that you wish to take the cell site out of service.

To take the cell site out of service:

- Notify the switch personnel of the plan.
- Verify that the voice channels have been handed off properly.
- Verify that the switch will not be adversely affected when you power down, disconnect, or loopback the modems.

- Power down, disconnect, or perform a local loopback to the modems connecting the switch to the Base Station.
- Run TEST_01- Laptop Emulator.
- Move the cursor to the Manual command using a combination of the **k4** (**Page Down**) key and knob rotation.
- Press the knob.
- If you are performing a SIG TEST, terminate the RF power from the SIG units, so that mobile stations do not attempt access. See "TEST_04 - Signaling Transceiver MANUAL Mode" on page 108.
- If you are testing modules other than the SIG units, send SIG OFF 0 and SIG OFF 1 commands using this TEST. This will turn off the signaling transceivers RF power.

Using the PC/Modem Mode

If you find that you are using the **Enter Command** function quite a lot, you might find it more convenient to use the PC/Modem mode of the Laptop Emulator. This mode requires that you have a PC connected to the serial port as shown in Figure 3-4 on page 47.

When the PC/Modem mode is selected, commands that you type on the PC are sent to the Base Station via the Test Set SERIAL 9 port. Responses from the Base Station may also be viewed on the PC.

Select the PC/Modem mode by scrolling to the **PC/Modem** field and pressing the knob. The Test Set screen will be cleared and you may type commands and view responses from the Base Station on the PC.

Once in the PC/Modem mode, you may not use any other Laptop Emulator functions until you exit. Exit the PC/Modem mode by pressing the **k3** (**Return**) key.

Messages

Messages from the Base Station will be displayed in the box labelled **Base Station Response**.

The first 27 characters sent by the Base Station may be displayed in the Base Station Response section of the display. If a message has more than 27 characters in it, press the **k5** (**Prt Full**) key to improve its readability. This will expand the responses to full screen. Pressing the **k2** (**Continue**) key will return the display to the reduced size. When many long reports are being sent from the Base Station, there is a possibility that a buffer overflow will occur in the Test Software. Some messages might not be displayed in this case. After you have pressed the **k5** (**Prt Full)** key, the possibility of overflow is greatly reduced, and the display will update faster.

Messages that have scrolled past the top of the message display cannot be retrieved by the Test Set for subsequent viewing.

Baud Rate

After TEST_01 starts, the Test Software will send an **Autobaud** command to the Base Station. Verify that a link exists by observing that a response appears on the Test Set display soon after the TEST starts. If response characters are not displayed, check the cables and connections from the Test Set to the Base Station, then send an **Autobaud** command using TEST_01 to match the baud rates and receive a response from the Base Station.

If the Base Station is disconnected from the Test Set after starting the Test Software, and connected to another RS232 source, the baud rate might change. Send an **Autobaud** using TEST_01 to re-establish it.

Base Station Password

If the Base Station is locked and cannot be controlled, it will send a "#" to the Test Set for display each time a command is sent to it. You must send a password to the Base Station to allow access. Enter the characters of the password using the knob to select characters from a list. Always select **Done** after entering characters. After a password is entered, the Test Software will use it as a default entry.

Base Station Report

If you wish to know the status of the Base Station, send the **REP VCC# GROUP#** command to it. The status of the channels under this voice channel controller (VCC) will be displayed on the Test Set. Verify the availability of the channel that you are testing by looking for INSOPT after the channel number. Use the status report to determine if the system is generally set up and operating properly. If you wish, the Test Software will display as you run voice transceiver tests.

Exiting TEST_01

Pressing the **k1** (**Done**) key causes the Test Set to begin running the next TEST in the sequence, or to complete the TEST if no additional TESTs have been entered.

TEST_02 - URDM or RDM Frequency/Level

This TEST verifies the performance of the URDM or RDM in the Base Station. It checks the frequency of the 3-MHz reference by measuring the transmitter frequency of a voice channel. In this process, it measures the level of the 3-MHz reference signal using the Test Set spectrum analyzer. It allows frequency and level adjustments if those are required.

You might wish to perform this TEST before testing transceivers so that you may be certain that the 3-MHz reference is operating properly.

If you plan to make adjustments to the frequency of the RDM or URDM 3-MHz frequency reference, you must first know the frequency error of the reference in the Test Set. Depending on when the Test Set was calibrated, its frequency error might be greater than that of the frequency reference in the cell site. Calibrate it if necessary.

Selecting the Test State

This TEST may be run in the In-Service Optimization mode or the MANUAL mode.

If "PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]" on page 126 is set to 0, the In-Service Optimization mode will be selected, and you will not be prompted to verify that the Base Station is set to In-Service Optimization mode. If PARAMETER_08 is set to 1, you will be prompted to verify that the site is set to MANUAL mode. If you wish to change the mode, pause the program by pressing the **Pause/Continue** key, access the TESTS (Test Parameters) screen, and change PARAMETER_08.

Calibration Factor

A calibration factor is used to enhance the accuracy of the Test Set spectrum analyzer when it measures the 3-MHz level. If the factor has not already been entered into "PARAMETER_11 RDM level correction factor" on page 127, perform the procedure described in "Determining the RDM Level Correction Factor" on page 30.

Questions Displayed

The Test Software will display the following question prompt before a frequency measurement is made:

```
Is channel free? If NO wait for a free channel
for intracell handoff before continuing.
```

If the channel is not free, press the **k2** (**No**) key and the Test Software will send a FREE command to the Base Station. Wait until the channel is taken out of service by the switch, then press the **k1** (**Proceed**) key. The Test Software will then send a DELete command to the Base Station, and the channel will be available for testing.

Frequency Error

The RDM or URDM frequency error displayed is the error of the voice transceiver, not the frequency error referenced to 3 MHz.

Tests Used

TEST_02 performs the following tests:

- URDM (or RDM) #1 frequency error
- URDM (or RDM) #2 frequency error
- URDM (or RDM) #1 level
- URDM (or RDM) #2 level

The appendix, "Appendix: Test Set Measurement Settings," on page 137 contains some of the Test Set settings used for these tests.

Parameters Used

TEST_02 uses the following parameters:

- PARAMETER_02 GN auto exit adj [0=no xx=times in spec]
- PARAMETER_03 GN perform adj [0=no 1=on fail 2 =always]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]
- PARAMETER_11 RDM level correction factor

Pass/Fail Limits Used

TEST_02 uses the following pass/fail limits:

- PASS/FAIL LIMIT_01 RDM frequency error
- PASS/FAIL LIMIT_02 RDM output level

TEST_03 - Voice Transceiver

This TEST makes measurements and prompts for adjustments so that the performance of the transceiver used for voice communication may be verified and optimized.

Selecting the Test State

TEST_03 is ordinarily performed in the In-Service Optimization mode. If PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL] is set to `0`, indicating that the Base Station set to the In-Service Optimization mode, the Test Software will not verify and display the status that the Base Station is in the In-Service Optimization mode. If PARAMETER_08 is set to 1, the Test Software will prompt you to verify that the Base Station is in MANUAL mode. If you wish to change the mode, pause the program by pressing the **Pause/Continue** key, access the TESTS (Test Parameters) screen, and change the parameter (see “Changing Test Parameters” on page 51).

If you elect to run the test in MANUAL mode, transmitter wideband data deviation will be measured. It cannot be measured in the In-Service Optimization mode using TEST_03. However, TEST_07 may be used to measure wideband data deviation if the cell site is not in the MANUAL mode (see “TEST_07 - Wideband Data on an Active Voice Channel” on page 117).

If you test receivers using a coupler connected to an antenna, you must verify that signals picked up by the antenna do not adversely affect measurements. If SINAD measurements are unstable, an extraneous signal might be the cause. Turn up the volume and listen until the co-channel or other interference subsides. You might wish to use what you learn to determine if there is a problem with the antenna or with the frequency plan.

You might find it preferable to take the cell site out of service when you are performing voice transceiver tests. In this way, you will be able to terminate antenna ports so that extraneous signals will not affect measurements. Also, you will be able to measure wideband data deviation without having to run TEST_07.

AMPS or NAMPS

At the start of the test for each radio, the Test Software will query the radio to determine whether it is an AMPS or an NAMPS type. If it is an NAMPS radio, NAMPS adjustment locations will be displayed. DST and DSAT will be measured. SAT and ST will not be measured if the radio is an NAMPS type.

Calibration Parameters

Calibration parameters must be entered for the measurement path loss to each of the harmonic filters (see “Cable Cal” on page 89).

Questions Displayed

If you are re-running a TEST, the Test Software will display the following question prompt:

```
Do you wish to continue testing?
```

If you press the **k1** (**Yes**) key, the Test Software will display the TEST_03 screen. There, you may update the values used in running TEST_03. The Test Software stores the previous test values; you must change those if you wish to use new values. Make any required changes and press the **k1** (**Proceed**) key to begin testing.

If you press the **k2** (**No**) key, the Test Software will display the Test Menu screen. In the Test Menu screen, you may select another test to run or you may exit the Test Software.

Frequency Error

If you notice a small frequency error when measuring the TX frequency, the cause of this error will usually be the RDM or URDM. This is because the frequency reference for the transceivers is in the RDM or URDM. Run TEST_02 at this time if you suspect that the RDM or URDM is the source of unacceptable frequency error (see “TEST_02 - URDM or RDM Frequency/Level” on page 101).

Keying the Transmitter

If you wish to make a power adjustment, you must press the **k3** (**Key/Dekey**) key to key the transmitter. You must press it again to de-key the transmitter before you remove the power amplifier (PA) module and make an adjustment to it. Key the transmitter again after you have installed the PA module.

Tests Used

For application situations in which you might wish to perform limited testing, such as testing only the receiver components, or testing only the transmitter components, the TEST_03 screen offers the menu options of selecting only the receiver tests, only the transmitter tests, or both sets of tests. Select the test sequence that meets the test objectives.

TEST_03 performs the following tests. This list includes the extended tests. See “PARAMETER_04 GN perform extended tests [0=no 1=yes]” on page 126. See the appendix, "Test Set Measurement Settings," on page 135 for filter, detector and some other Test Set settings used.

- Report from the Base Station
- RX audio output (with adjustment)
- RX SINAD for each antenna
- RX audio distortion (extended test)
- RX hum and noise (extended test)
- RX expandor response (extended test)
- RX audio response (extended test)
- RX signal SAT/DSAT
- RX no signal SAT/DSAT
- RX signal ST/DST detect
- RX no signal ST/DST detect
- TX frequency error (The RDM/URDM adjustment is in TEST_02.)
- TX power @level 0 (with adjustment)
- TX SAT frequency error
- TX SAT/DSAT peak deviation (with adjustment)
- TX TEST JACK output (with adjustment)
- TX loopback level (if PARAMETER_43 TX perform loop back test [0=no 1=yes]) is set to 1)
- TX peak voice limiting (with adjustment)
- TX voice deviation (with adjustment)
- TX audio distortion (extended test)
- TX hum and noise (extended test)
- TX compandor track error (extended test)
- TX audio frequency response (extended test)
- TX peak data deviation (in MANUAL mode) (with adjustment)

Parameters Used

TEST_03 uses the following parameters:

- PARAMETER_02 GN auto exit adj [0=no xx=times in spec]
- PARAMETER_04 GN perform extended tests [0=no 1=yes]
- PARAMETER_05 GN site Average Voice Level (AVL)
- PARAMETER_06 GN site has LNAs [0=no 1=yes]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]
- PARAMETER_10 GN verify all selections [0=no 1=yes]
- PARAMETER_14 RX level for voice DSAT/DST detector
- PARAMETER_15 RX level for voice SAT/ST detector
- PARAMETER_16 RX path loss to antenna 1 through PARAMETER_21 RX path loss to antenna 6
- PARAMETER_22 RX/TX audio freq response step [.01-2.7]
- PARAMETER_25 TX output power for level 0 through PARAMETER_32 TX output power for level 7
- PARAMETER_35 TX path loss to harmonic filter 1 through PARAMETER_42 TX path loss to harmonic filter 8
- PARAMETER_43 TX perform loop back test [0=no 1=yes]
- PARAMETER_44 TX stepping PA pwr lvls tested [0-127]
- PARAMETER_45 TX voice peak limit step [1 - 200]
- PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

Pass/Fail Limits Used

TEST_03 uses the following pass/fail limits:

- PASS/FAIL LIMIT_03 RX audio distortion
- PASS/FAIL LIMIT_04 RX audio output level
- PASS/FAIL LIMIT_05 RX audio response dev from -6 dB/oct R1
- PASS/FAIL LIMIT_06 RX audio response dev from -6 dB/oct R2
- PASS/FAIL LIMIT_07 RX expandor track error <0 dB
- PASS/FAIL LIMIT_08 RX expandor track error >0 dB
- PASS/FAIL LIMIT_09 RX hum and noise
- PASS/FAIL LIMIT_12 RX sensitivity with LNA
- PASS/FAIL LIMIT_13 RX sensitivity without LNA
- PASS/FAIL LIMIT_14 RX sensitivity without LNA narrow mode
- PASS/FAIL LIMIT_15 RX SINAD at sensitivity spec
- PASS/FAIL LIMIT_16 TX audio distortion
- PASS/FAIL LIMIT_17 TX audio response dev from 6 dB/oct
- PASS/FAIL LIMIT_18 TX compressor track error <0 dB
- PASS/FAIL LIMIT_19 TX compressor track error >0 dB
- PASS/FAIL LIMIT_20 TX data deviation
- PASS/FAIL LIMIT_22 TX FM hum and noise
- PASS/FAIL LIMIT_23 TX frequency error
- PASS/FAIL LIMIT_25 TX output power error at level 0
- PASS/FAIL LIMIT_34 TX SAT deviation
- PASS/FAIL LIMIT_35 TX SAT frequency error
- PASS/FAIL LIMIT_36 TX test point JK output (dBm)
- “PASS/FAIL LIMIT_37 TX voice deviation” on page 136
- PASS/FAIL LIMIT_38 TX voice deviation narrow mode
- PASS/FAIL LIMIT_39 TX voice limiting deviation
- PASS/FAIL LIMIT_40 TX voice limiting deviation narrow mode

TEST_04 - Signaling Transceiver MANUAL Mode

This TEST determines the performance of the Signaling Transceiver and allows for receiver calibration. This TEST may be performed in the MANUAL mode only; the cell site must be taken out of service.

CAUTION While testing the SIG unit, a high-power load must be placed on the RF coupler output leading to the antenna. It must be capable of handling at least 30 watts. The load is necessary to prevent the SIG transmitter signal from being radiated to mobile stations. Place the high-power load on the RF coupler output leading to the antenna after taking the cell site out of service.

MANUAL Mode

There are several ways to take the cell site out of service:

- See the procedure to take the cell site out of service in "Sending Commands" on page 98.
- Ask the switch personnel to perform the task.
- Take the cell site out of service through the switch using a laptop PC.

After you take the cell site out of service, send SIG OFF 0 and SIG OFF 1 commands if the Signaling Transceivers are still connected to an antenna. You should terminate the outputs to antennas to prevent the SIG signal from being radiated. When you run TEST_04, a SIG ON will be sent shortly after the TEST starts.

Verify that PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL] is set to 1 (MANUAL mode). Access the TESTS (Test Parameters) screen to do this. You must do this only the first time that you run this TEST because the parameter will be stored. If PARAMETER_08 is not set to 1 and you run TEST_04, the Test Software will prompt you to change the parameter.

To set PARAMETER_08 to 1:

- Press the **Pause/Continue** key to pause the program, or, press the **Shift** and then the **Pause/Continue** (**Reset**) key to stop the program.
- Press the **Menu** key. The Test Software will display the SOFTWARE MENU screen.
- From the **`CUSTOMIZE TEST PROCEDURE:`** list, select the **`Parm Test Parameters`** field. The Test Software will display the TESTS (Test Parameters) screen.
- In the **`Parm#`** column, select **`8`**.
- Scroll to the **`Value`** field.
- Using the DATA ENTRY keys, enter 1, then press the **Enter** key.
- Press the **k5** (**`Main Menu`**) key. The Test Software will display the SOFTWARE MENU screen.
- Press the **k1** (**`Run Test`**) key to run the program.

HDII or LD Equipment

The Test Software will display a field for a selection of whether the cell site has HDII or LD equipment. Calibration factors for handoff levels must be uploaded to the signaling channel controller (SCC) if it is an HDII SCC. Make certain of the type of SCC in the system, because there might be a mixture of LD and HDII equipment at the site.

LD equipment may be calibrated at –60, –90, or –100 dBm. The Test Software will assign USER keys to allow you to select the level. On HDII equipment, calibration is performed at –90 dBm.

Calibration Parameters

Parameters must be entered into the Test Software for the path loss to each of the harmonic filters (see “Cable Cal” on page 89).

Questions Displayed

When the test is first run, the Test Software will display the TEST_04 menu, in which you may fill in values that define the site elements to be tested. Other entries determine how the results will be presented.

Enter the number for the TX harmonic filter that is passing the signal being measured. Refer to a site diagram or the Motorola cell site manual to see which harmonic filters are used by the signaling transceivers. Make connection to the couplers that are installed at the outputs of the harmonic filters.

Select the type of signaling unit to be tested and select SSI units of **HEX** or **DBM**.

When the entries are correct, press the **k1** (**Proceed**) to start the test.

The Test Software then sends commands to the Base Station to select the CSC and set up the SCC and SIG unit.

The Test Software will display a diagram to show the connection of the equipment. Refer to Figure 3-2 on page 44 and Figure 3-3 on page 45 for a depiction of these connections.

The TEST_04 menu includes an additional USER key, **k3** (**LNA Offs**). If you press the **k3** (**LNA Offs**) key to check the LNA offsets (and you have set the parameters to indicate that there are LNAs installed), the Test Software will check the state of the LNA offset values using a Base Station hardware query. If the information does not match, the Test Software will display a screen that prompts you that there is a mismatch and allows you to modify the values or continue without change.

If you wish to modify the offsets, press the **k2** (**Modify**) key. To continue with the current LNA offset values (not recommended), press the **k1** (**Proceed**) key.

Also, the Test Software will display question prompts to determine whether you intend to calibrate the signaling transceiver. PARAMETER_01 GN always cal sig/scan [0=no 1=yes] may be used to cause the Test Software to calibrate the signaling transceiver automatically. If you have not enabled this mode, the Test Software will display the following question prompt when a failure in the RX SSI calibration is encountered:

Do you want to calibrate this frequency?

If you are confident that the test has been performed properly, press the **k1** (**Yes**) key. The testing will proceed. If you press the **k5** (**All cal**) key, any further errors will result in automatic calibration.

If you are testing at a non-LD site, the Test Software will display the following question prompt at the end of testing:

Do you want to upload the sig cal data to the SCC?

If you press the **k1** (**Yes**) key, and the firmware revision of the Base Station is 4.5.0.0 or later, the Test Software will display question prompts to determine if you wish to display the cal data on the Test Set display. If a printer is connected and configured, the information may be printed also (see “Sending Test Results to a Serial Printer” on page 73, “Sending Test Results to a Parallel Printer” on page 74, or “Sending Test Results to an HP-IB Printer” on page 75, as appropriate).

When the TEST on this unit is complete, the Test Software will display the following question prompt:

Do you want to test another signaling unit?

If you press the **k2** (**No**) key, the Test Software will display the Test Menu screen and you may select a new test to run. If you press the **k1** (**Yes**) key, the Test Software will return to the TEST_04 menu and may update the harmonic filter number (and other entries) and re-run the test.

If you notice a frequency error when measuring the TX frequency, the source of this error will usually be the URDM or RDM. This is because the frequency reference for the transceivers is in the URDM or RDM. Run TEST_02 at this time if you suspect that the URDM or RDM is the source of frequency error (see “TEST_02 - URDM or RDM Frequency/Level” on page 101).

Tests Used

TEST_04 performs the following tests. See the appendix, "Test Set Measurement Settings," on page 135 for filter, detector and some other Test Set settings used.

- TX frequency error (The RDM/URDM adjustment is in TEST_02.)
- TX power (with adjustment)
- TX data deviation (with adjustment)
- RX SINAD
- RX SSI calibration and linearity

Parameters Used

TEST_04 uses the following parameters:

- PARAMETER_01 GN always cal sig/scan [0=no 1=yes]
- PARAMETER_02 GN auto exit adj [0=no xx=times in spec]
- PARAMETER_03 GN perform adj [0=no 1=on fail 2 =always]
- PARAMETER_06 GN site has LNAs [0=no 1=yes]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]
- PARAMETER_10 GN verify all selections [0=no 1=yes]
- PARAMETER_16 RX path loss to antenna 1 through PARAMETER_21 RX path loss to antenna 6
- PARAMETER_33 TX output power for signaling unit
- PARAMETER_35 TX path loss to harmonic filter 1 through PARAMETER_42 TX path loss to harmonic filter 8
- PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

Pass/Fail Limits Used

TEST_04 uses the following pass/fail limits:

- PASS/FAIL LIMIT_10 RX scan and sig calibration reading
- PASS/FAIL LIMIT_11 RX scan sig linearity error
- PASS/FAIL LIMIT_12 RX sensitivity with LNA
- PASS/FAIL LIMIT_13 RX sensitivity without LNA
- PASS/FAIL LIMIT_15 RX SINAD at sensitivity spec
- PASS/FAIL LIMIT_20 TX data deviation
- PASS/FAIL LIMIT_23 TX frequency error
- PASS/FAIL LIMIT_33 TX output power error for signaling unit

TEST_05 - Scanning Transceiver MANUAL Mode

This TEST determines the performance of the scanning receivers, and allows for receiver calibration. This TEST may be performed in the MANUAL mode only; the cell site must be taken out of service.

MANUAL Mode

For a description, see “MANUAL Mode” on page 108.

After you take the cell site out of service, send SIG OFF 0 and SIG OFF 1 commands if signaling transceivers are connected to an antenna. You must do this to prevent mobile stations from attempting to access the cell site.

AMPS or NAMPS

The Test Software will query the Base Station to determine whether it is an AMPS or an NAMPS site. If it is an NAMPS site, DSAT will be measured. The DSAT code used will be sent by the Base Station to the Test Set.

Connections

The Test Software will display a diagram to show the connection of the equipment. The Test Set DUPLEX OUT connector is used to supply an RF signal to the scan receivers. Transmitter output line connection to the RF IN/OUT connector is shown on the Test Set display drawing. This connection is optional. It may be left connected if you use it for other TESTs.

See Figure 3-2 on page 44 and Figure 3-3 on page 45 for a depiction of connections.

Calibration Parameters

Parameters must be entered into the Test Software for the path loss to each of the RX antennas (see “Cable Cal” on page 89).

Questions Displayed

The Test Software will display a prompt if the LNA offsets do not match. At the start of testing, the Test Software will compare the setting of PARAMETER_06 GN site has LNAs [0=no 1=yes] and the answers to its Base Station hardware query. If the information does not match, the Test Software will display the following question prompt:

```
Do you want to modify LNA offsets or continue?
```

If you wish to modify the offsets, press the **k2** (**Modify**) key. To continue with the current LNA offset values (not recommended), press the **k1** (**Proceed**) key.

The TEST_05 menu will allow you to enter values for the VCC number of the receiver being tested. Refer to a site diagram or the Motorola Cell Site manual for this information.

The TEST_05 menu also includes an entry to indicate whether you are testing in the AMPS or the extended AMPS frequency range (selections are **AMPS** or **E-AMPS**).

The Test Software will display question prompts to determine if you intend to calibrate the scan receiver.

PARAMETER_01 GN always cal sig/scan [0=no 1=yes] may be used to cause the program to calibrate the Scan Receiver automatically. If you have not enabled this mode, the Test Software will display the following question prompt:

```
Do you want to calibrate this frequency?
```

If you are confident that the test has been performed properly, press the **k1** (**Yes**) key.

The Test Software will perform linearity tests at –60 dBm and –100 dBm. If you wish to reduce the number of channels at which linearity is tested, set PARAMETER_23 SC fewer linearity channels [0=no 1=yes] to 1 (yes). The Test Software will perform tests at the same four frequencies at which the SINAD test is performed.

If testing is started at a non-LD site, the Test Software will display the following question prompt:

```
Do you want to upload the scan cal data to the VCC?
```

If you press the **k1**(**Yes**) key, and the firmware revision of the Base Station is 4.5.0.0 or later, the Test Software will display question prompts to determine if you wish to display the cal data on the Test Set display. If a printer is connected and configured, the information may be printed also (see “Sending Test Results to a Serial Printer” on page 73, “Sending Test Results to a Parallel Printer” on page 74, or “Sending Test Results to an HP-IB Printer” on page 75, as appropriate).

When the TEST on this channel is complete, the Test Software will display the following question prompt:

```
Do you want to test another scan receiver?
```

If you press the **k1** (**Yes**) key, the TEST will be repeated for another VCC that you select.

NOTE Signals picked up by antennas can affect measurements and result in inaccurate calibration data. Install 50-ohm terminations on the RF coupler ports leading to the antennas if necessary.

Tests Used

TEST_05 performs the following tests. See the appendix, "Test Set Measurement Settings," on page 135 for filter, detector and some other Test Set settings used.

- RX scan sensitivity for each antenna
- RX SAT/DSAT detect
- RX SSI calibration and linearity

Parameters Used

TEST_05 uses the following parameters:

- PARAMETER_01 GN always cal sig/scan [0=no 1=yes]
- PARAMETER_06 GN site has LNAs [0=no 1=yes]
- PARAMETER_07 GN site [0=non-wireline 1=wireline]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]
- PARAMETER_10 GN verify all selections [0=no 1=yes]
- PARAMETER_12 RX level for scanner DSAT detector
- PARAMETER_13 RX level for scanner SAT detector
- PARAMETER_16 RX path loss to antenna 1 through PARAMETER_21 RX path loss to antenna 6
- PARAMETER_23 SC fewer linearity channels [0=no 1=yes]
- PARAMETER_24 SC skip items in scan test [0=no 1=yes]

Pass/Fail Limits Used

TEST_05 uses the following pass/fail limits:

- PASS/FAIL LIMIT_10 RX scan and sig calibration reading
- PASS/FAIL LIMIT_11 RX scan sig linearity error
- PASS/FAIL LIMIT_12 RX sensitivity with LNA
- PASS/FAIL LIMIT_13 RX sensitivity without LNA
- PASS/FAIL LIMIT_14 RX sensitivity without LNA narrow mode
- PASS/FAIL LIMIT_15 RX SINAD at sensitivity spec

TEST_06 - Combiner Adjustment

This TEST uses the voice transceiver or the signaling unit as a signal source to optimize the adjustment of the power combiner (see Figure 3-2 on page 44 and Figure 3-3 on page 45 for a depiction of connections to the Base Station, Test Set, and accessories.

This test runs in the MANUAL mode (see "MANUAL Mode" on page 108).

You may run this TEST in the same way that power is tested in TEST_03 or TEST_04, leaving the RF coupler in the path as the power is measured (see "TEST_03 - Voice Transceiver" on page 103 or "TEST_04 - Signaling Transceiver MANUAL Mode" on page 108). The spectrum analyzer or the power meter may be used, depending on the level of power available at the coupled port. Set PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr] as desired. You must perform calibration using the same measuring device (spectrum analyzer or power meter) that you use in running TEST_06.

Calibration Parameter

You must enter a calibration factor into PARAMETER_34 TX path loss to combiner for adjustment. This factor (called "TXC") can be measured using the Cable Cal routine that is invoked from the Configuration Menu screen (see "Cable Cal" on page 89).

Running TEST_06 - Combiner Adjustment

After you select TEST_06 and press the knob, the combiner adjustment menu will be displayed. Select the **`Controller`** type (**`CSC`** for a signalling transceiver or **`VCC`** for a voice channel) and fill in the corresponding values in the menu.

Once the values have been entered, press the **`k1`** (**`Proceed`**) key to run the test. First, system initialization will take place, and then the Test Software will send commands to the Base Station.

A signal from the selected channel will be available at the output of the combiner, and power output adjustment may be performed. Adjust the Combiner by loosening and resetting the Combiner bolts for a minimum on the reflected power meter. Check the forward-power reading on the Test Set.

Questions Displayed

After you have adjusted the combiner for the channel being tested and the measured result is displayed, the Test Software will display the following prompt:

```
Do you want to test another channel?
```

Test Used

TEST_06 performs the following test. See "Test Set Measurement Settings," on page 135 for filter, detector, and some other Test Set settings used.

- TX power with adjustment

Parameters Used

TEST_06 uses the following parameters:

- PARAMETER_02 GN auto exit adj [0=no xx=times in spec]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]
- PARAMETER_10 GN verify all selections [0=no 1=yes]
- PARAMETER_25 TX output power for level 0 through PARAMETER_32 TX output power for level 7
- PARAMETER_33 TX output power for signaling unit
- PARAMETER_34 TX path loss to combiner for adjustment
- PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

Pass/Fail Limits Used

TEST_06 uses the following pass/fail limits:

- PASS/FAIL LIMIT_26 TX output power error at level 1
- PASS/FAIL LIMIT_33 TX output power error for signaling unit

TEST_07 - Wideband Data on an Active Voice Channel

TEST_07 provides a method for measuring the wideband data deviation of a voice transceiver without taking the cell site out of service. The TEST is performed while the voice transceiver is on an active voice channel with a call from a mobile station. You may perform this TEST on Motorola Base Stations with a firmware revision later than 4.3.2.1.

In this TEST, you will use a mobile station to set up a call. After the Base Station and telephone have established connection, the deviation of the data transmitted by the Base Station will be measured.

The Test Software will prompt you for the VCC and voice transceiver that you wish to test. You must press the **k2** (**`Send USE`**) key as you are setting up the call from the mobile station. Press the **k3** (**`Send FREE`**) key if the channel is not available. Verify that connection is made by turning up the volume on the Test Set. When you establish connection, press the **k1** (**`Yes`**) key to answer the question displayed, and to make a measurement.

The first measurement will be made before the wideband data is transmitted by the transmitter. Press the **k3** (**`Send TM`**) key to command the Base Station to send a wideband data burst. The deviation will then be displayed.

Press the **k2** (**`To Chan`**) key to select another channel to test. The channel list will be displayed.

The Test Software will display the question prompt:

```
Is the new channel free? Press NO to return to channel list.
```

Press the **k1** (**`Yes`**) key when the channel is available.

NOTE You should plug a Bantam 309 plug into the EQUIP XMT jack. This will prevent audio from a live microphone or other source from modulating the transmitter and affecting the deviation measurement.

Wideband data deviation measurement is performed using the Peak ± max hold detector. This detector captures the instantaneous peak deviation of the transmitter.

The data deviation measurement is affected by audio filters at the output of the FM demodulator. The Test Software will select the <20-Hz high-pass filter and the >99-kHz low-pass filter to minimize the effect of the filters.

Test Used

The following test is performed in TEST_07:

- Wideband data deviation on the selected voice channel

Parameters Used

TEST_07 uses no parameters.

Pass/Fail Limits Used

TEST_07 uses no pass/fail limits.

TEST_08 - Manual Switch and Calibration Aid

This TEST includes several routines that can assist you in calibrating and controlling (manually) cell site equipment. Typically, this TEST will not be included in a sequence. Routines in this TEST may be run individually when required.

For example, the **`Tune the 8935 to a channel number`** routine may be used to set the Test Set RF analyzer, receiver, spectrum analyzer, and RF generator to a channel number.

Rotate the knob to select the desired function, then press the knob to start the routine.

Routines

The following functions are available:

`Go to the Laptop Emulator`

To send a command to the Base Station, and view messages from the Base Station.

`Set the 8935 for RX path calibration`

`Read the spec. analyzer TX path calibration`

`Read the spec. analyzer RDM path calibration`

`Tune the 8935 to a channel number`

To set the Test Set RF Generator Frequency and Tune Frequency manually.

`Switch to receiver antenna #1-#6`

To set the RF switch manually.

`Switch to audio JK / RCV`

To set the audio switch from TEST JK to RCV manually.

Parameters Used

TEST_08 uses no parameters.

Pass/Fail Limits Used

TEST_08 uses no pass/fail limits.

TEST_09 - Calculate Transmitter Power

This TEST calculates the maximum permissible transmitter power given the ERP limit, the antenna gain, and the losses of various items in the system. You may select from a list of items, and the TEST will calculate the loss introduced by each item. No measurements are performed in this TEST. This TEST is ordinarily run when the system is installed. The maximum permissible transmitter power may be used as a parameter for TESTs that determine if the transmitters are operating acceptably. A single parameter is used, so it is important to verify that the differences between antenna paths is negligible.

After you press the **k1** (**Run Test**) key, the Test Set will display a list of system hardware elements. After you make an entry, the program will recalculate the system attenuation, input to antenna, and harmonic filter output. You must enter this last value into PARAMETER_35 TX path loss to harmonic filter 1 through PARAMETER_42 TX path loss to harmonic filter 8. These values may be measured by running the Cable Cal routine (see “Cable Cal” on page 89).

Available Entries

The following entries may be made. Default values are shown.

- Transmit ERP = 100 watts
- Antenna Gain = 11.5 dB
- Amount of 7/8 in. foam cable = 0 ft.
- Amount of 1 1/4 in. foam cable = 0 ft.
- Amount of 1 5/8 in. foam cable = 0 ft.
- Amount of 1 5/8 in. air cable = 0 ft.
- Amount of 1/2 in. foam jumper = 0 ft.
- Amount of 1/2 in. superflex jumper = 0 ft.
- Lightning suppressor attenuation = 0.1 dB
- Other component(s) loss = 0.0 dB
- Mismatch loss = 0.2 dB
- Number of connectors = 6 QTY

Select **Done** or press the **k1** (**Done**) key when entries are complete.

Press the **k2** (**Page Up**) key or the **k4** (**Page Down**) key as appropriate to view all selections.

Parameters Used

TEST_09 uses no parameters.

Pass/Fail Limits Used

TEST_09 uses no pass/fail limits.

TEST_10 - Voice Channel Manual Test Mode

This TEST semi-automatically checks many characteristics of a voice transceiver. It is generally used when changes are to be made in test conditions or the sequence of TESTs as the test is running.

This TEST may be run in the MANUAL mode or In-Service Optimization mode. If PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL] is set to 0, the TX data deviation test is not displayed in the list of measurements.

In this TEST, select a test from the list in the window labelled **Measure** by moving the cursor to the desired test and pressing the knob. The Test Software will display measurement results in the window above the **Measure** window.

You may use the Test Set or an external PC to control the Base Station. If you use an external PC, the Test Software will display a prompt for the channel number being tested. The last channel tested will be displayed in the upper left-hand area of the TEST screen. Press the **k1** (**Proceed**) key to use the value displayed, or use the DATA ENTRY keys to enter a new channel number.

Pressing the **k5** (**Next Wind**) key moves the cursor to one of the other windows on the TEST screen. Parameters may be changed and Base Station commands may be sent by selecting the desired item after the cursor is in the corresponding window.

In making entries into parameters, the cursor will be in the upper left-hand corner of the screen. Enter data values using the DATA ENTRY keys. End the entry process by pressing the **Enter** key.

The values that you enter into the parameters do not change the values in the list in the TESTS (Test Parameters) screen. The initial values of the parameters used in this manual TEST are coded into the Test Software. After you change the values, those will be retained in the Test Set battery-backed-up RAM. The values will be restored to those coded into the Test Software if you load a different program into the Test Set memory.

The parameters that you enter into the **Parameters** window may be saved to an SRAM card file. The filename of the SRAM card file is always **uMAN_PARM**. When you select the **Store Parameters** field from the list in the **Measure** window, the Test Software will attempt to store the latest values of parameters in a file with that filename. The Test Software will display the following message if there is an existing parameter file on the card:

.....Duplicate file name.....

If you do not wish to over-write the old file, you must save the parameters on a different SRAM card.

This TEST uses parameters from the TESTS (Test Parameters) screen that correct for the losses of cables, couplers, and switches.

The **Tune test set** field in the list in the **Measure** window does not relate to a voice channel test. When this field is selected, the Test Set may be tuned to frequencies in the scan receiver channel list. After you select the **Wireline Ch** field or the **Non-wireline Ch** field from the list in the **Parameters** window, the Test Software will assign USER keys to allow you to change the channel and select a different antenna. Also, you may change the RF level by selecting that item in the **Parameters** window. As an example of the use of **Tune test set**, a laptop PC may be used to send commands manually and read the RSSI of a scan receiver.

Parameters Used

The parameters displayed in the TEST_10 screen window labelled **Parameters** are not associated with the parameters on the TESTS (Test Parameters) screen.

TEST_10 uses the following parameters from the TESTS (Test Parameters) screen:

- PARAMETER_02 GN auto exit adj [0=no xx=times in spec]
- PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]
- PARAMETER_16 RX path loss to antenna 1 through PARAMETER_21 RX path loss to antenna 6
- PARAMETER_25 TX output power for level 0 through PARAMETER_32 TX output power for level 7
- PARAMETER_35 TX path loss to harmonic filter 1 through PARAMETER_42 TX path loss to harmonic filter 8
- PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

Pass/Fail Limits Used

TEST_10 uses the following pass/fail limits to determine the position of the lines displayed on the meter when you press the **k3** (**Zoom**) key:

- PASS/FAIL LIMIT_01 RDM frequency error
- PASS/FAIL LIMIT_04 RX audio output level
- PASS/FAIL LIMIT_20 TX data deviation
- PASS/FAIL LIMIT_24 TX loop-back level
- PASS/FAIL LIMIT_25 TX output power error at level 0
- PASS/FAIL LIMIT_34 TX SAT deviation
- PASS/FAIL LIMIT_36 TX test point JK output (dBm)
- PASS/FAIL LIMIT_37 TX voice deviation
- PASS/FAIL LIMIT_39 TX voice limiting deviation

TEST_11 - Test Menu

This TEST allows you to bypass the Tests Subsystem and select and run TESTs very quickly and very easily. This TEST is useful in running impromptu sequences for special testing circumstances. Although selecting TESTs in the formal manner, from the TESTS (Order of Tests) screen, is not difficult, this TEST allows you to run TESTs in special circumstances somewhat faster and with easier selection.

When you select this TEST from the TESTS (Order of Tests) screen, or when this TEST is encountered in a test sequence, the Test Software will display the Test Menu screen. This screen contains the following menu:

- Return - Selecting this field causes the Test Software to display the Configuration Menu screen.
- TEST_01 - Laptop Emulator
- TEST_02 -URDM or RDM frequency/level
- TEST_03 - Voice Transceiver
- TEST_04 - Signaling transceiver MANUAL mode
- TEST_05 - Scanning receiver MANUAL mode
- TEST_06 - Combiner Adjustment
- TEST_07 - Wideband data on active Voice channel
- TEST_08 - Manual switch and calibration aid
- TEST_09 - Calibrate Transmitter Power
- TEST_10 - Voice channel manual test mode
- Quit - Selecting this field causes the Test Software to close

This menu allows you to select the next TEST to be run. You need not return to the SOFTWARE MENU screen to run the TEST. Selecting a TEST (that is, moving the cursor to the TEST name and pressing the knob) causes the TEST to run. When the TEST that you selected completes its testing, it terminates, and this screen returns to the display. You may select and run the next TEST, and continue to select and run as many TESTs as required, in any order. You may repeat TESTs as many times as is required.

Thus, you might find this test useful instead of defining a test sequence in the TESTS (Order of Tests) screen. In impromptu testing situations, this test is typically quicker to use than is the TESTS (Order of Tests) screen.

When you have completed special testing, you may select either of two screens for display:

- Select the **`Return`** field. The Test Software will display the Configuration Menu screen.
- Select the **`Quit`** field. The Test Software will close and the Test Set will display the SOFTWARE MENU screen.

Parameters Used

TEST_11 uses no parameters.

Pass/Fail Limits Used

TEST_11 uses no pass/fail limits.

Parameter Descriptions

Parameters are used to define the conditions under which a test will run. You may edit the parameters to change the default values, and to meet specific testing requirements and conditions. Each parameter may be used in one test or more.

For information on editing parameters, see "Customizing Test Procedures" on page 50.

The list of parameters is arranged alphabetically. The first two to four letters in the title of each parameter indicate its classification. The classifications are:

- **GN** – General
- **RDM** – Reference Distribution Module
- **RX** – Receiver
- **RX/TX** – Receiver/Transmitter 171
- **SC** – Scan
- **ZZZZ** – Demo Mode
- **TX** – Transmitter

PARAMETER_01 GN always cal sig/scan [0=no 1=yes]

Enter the desired control choice to determine whether the program will provide calibration of the SIG units and scan receivers after measurements are made. Calibration is performed only when the test has failed.

PARAMETER_02 GN auto exit adj [0=no xx=times in spec]

Enter the desired control choice to determine the number of measurements that are required to be within the adjustment pass/fail limits before the adjustment procedure terminates.

PARAMETER_03 GN perform adj [0=no 1=on fail 2 =always]

Enter the desired control choice to determine the conditions under which the program will provide an adjustment procedure.

If this parameter is set to `0`, the Test Software will not provide for adjustment under any conditions.

If this parameter is set to `1` and a failure occurs, the adjustment screen will appear. After you make the adjustment, you may re-run the test to re-record the adjusted test result. If no adjustment is possible, you will be offered the opportunity to re-run the test.

If this parameter is set to `2`, the adjustment screen will appear in every instance in which an adjustment is possible. After you make the adjustment, you may re-run the test to re-record the adjusted test result.

PARAMETER_04 GN perform extended tests [0=no 1=yes]

Enter the desired control choice to determine whether additional voice transmitter and voice receiver tests will be performed. The following tests are performed if this parameter is set to 1:

- RX audio distortion
- RX hum and noise
- RX expandor response
- RX audio response
- TX audio distortion
- TX hum and noise
- TX compandor track error
- TX audio frequency response

PARAMETER_05 GN site Average Voice Level (AVL)

Enter the desired value (in dBm) of the standard level to be used for transmitter input power, in dBm into a 600-ohm load.

PARAMETER_06 GN site has LNAs [0=no 1=yes]

Enter the desired control choice to indicate whether low noise amplifiers are installed at the receiver inputs. Selecting `1` indicates that LNAs are installed. When testing starts, the Test Software will read the setting of this parameter, then query the Base Station as to whether LNAs are installed. If the two results do not agree, the Test Software will display a prompt stating that the offsets do not match.

PARAMETER_07 GN site [0=non-wireline 1=wireline]

Enter the control choice to indicate whether the site is a wireline or non-wireline type and thus determine the RF channels to be used for the test.

PARAMETER_08 GN test state of [0=INS-OPT 1=MANUAL]

Enter the desired control choice to indicate whether the site is in or out of service. If testing is to be done with the Base Station in service (that is, in In-Service Optimization mode), set this parameter to 0. If testing is to be done with the Base Station out of service (that is, in MANUAL mode), set this parameter to `1`. At the start of testing, the Test Software will read the setting of this parameter and prompt you to verify the mode if it is set to 1, but not if it is set to 0.

PARAMETER_09 GN type of site [0=omni 1=sec .skip ant]

Enter the control choice to indicate the type of site: omni or sectored receive.

- If the cell site is an omni receive site, set this parameter to `0`. The test system will then test two RX antennas.
- If the cell site is a sectored receive site, set this parameter to `1`. The test system will then test six RX antennas.
- If the cell site does not use specific antennas, the test system will skip the testing of these antennas if each is entered after the decimal point in one of the above cases.

For example, if the site is a sectored site but antennas 2, 4, and 5 are not to be tested, the entry will be 1.245. This entry will direct the test system to test the cell site as a sectored site, but skip testing for antennas 2, 4, and 5. Note that an entry of 0.245 would not be correct, because antennas 4 and 5 are not tested on an omni site.

PARAMETER_10 GN verify all selections [0=no 1=yes]

Enter the desired control choice to indicate to the Test Software that verification of entries is required. When this parameter is set to `1`, the program will prompt you for verification of each entry.

PARAMETER_11 RDM level correction factor

Enter the desired value (in dB) to sets the correction factor that is used to enhance the accuracy of 3-MHz level measurements using the Test Set spectrum analyzer (see “Determining the RDM Level Correction Factor” on page 30).

PARAMETER_12 RX level for scanner DSAT detector

Enter the desired value (in dBm) to set the signal generator levels that are applied to the scan receiver during DSAT tests.

PARAMETER_13 RX level for scanner SAT detector

Enter the desired value (in dBm) to set the signal generator levels that are applied to the scan receiver during SAT tests.

PARAMETER_14 RX level for voice DSAT/DST detector

Enter the desired value (in dBm) to set the signal generator levels that are applied to the voice receiver during digital supervisory audio tone (DSAT) and digital signaling tone (DST) tests.

PARAMETER_15 RX level for voice SAT/ST detector

Enter the desired value (in dBm) to set the signal generator levels that are applied to the voice receiver during supervisory audio tone (SAT) and signaling tone (ST) tests.

PARAMETER_16 RX path loss to antenna 1 through PARAMETER_21 RX path loss to antenna 6

Enter the desired value (in dB) to set the calibration factor that the Test Software will use to accommodate cable and RF coupler losses when setting the Test Set signal generator level. This value can be determined by measurement (see “Cable Cal” on page 89).

PARAMETER_22 RX/TX audio freq response step [.01-2.7]

Enter the desired value (in kHz) of the audio frequency step that will occur as the frequency response of the audio passband is measured. The two end points, 300 Hz and 3 kHz, are always measured.

PARAMETER_23 SC fewer linearity channels [0=no 1=yes]

Enter the desired control choice that determines whether to reduce the number of channels at which RSSI linearity tests will be performed. Set this parameter to `1` if you wish to reduce the number of channels. The fourteen test channels will be reduced to the four channels at which SINAD is performed.

PARAMETER_24 SC skip items in scan test [0=no 1=yes]

Enter the desired control choice that determines whether to skip some of the scan receiver tests. If you set this parameter to `1`, the Test Software will assign USER keys that allow you to skip SINAD and SAT tests and begin testing on the next antenna.

PARAMETER_25 TX output power for level 0 through PARAMETER_32 TX output power for level 7

Enter the desired value (in watts) to set the rated RF power of the voice transmitter at the stated power level.

PARAMETER_33 TX output power for signaling unit

Enter the desired value (in watts) to set the rated RF power level of a signaling transmitter.

PARAMETER_34 TX path loss to combiner for adjustment

Enter the desired value (in dB) to set the calibration factor that is used in TEST_06 - Combiner Adjustment to account for cable losses, RF coupler coupling factors, and the Test Set power meter measurement error. This value can be determined by measurement (see “Cable Cal” on page 89 and “TEST_06 - Combiner Adjustment” on page 115).

PARAMETER_35 TX path loss to harmonic filter 1 through PARAMETER_42 TX path loss to harmonic filter 8

Enter the desired value (in dB) to set the calibration factor that accounts for cable losses, RF coupler coupling factors, and Test Set measurement error when measuring transmitter power. This value can be determined by measurement (see “Cable Cal” on page 89).

PARAMETER_43 TX perform loop back test [0=no 1=yes]

Enter the desired control choice to determine whether loop back test will be performed. If this parameter is set to `1`, the average voice level will be applied to the TX line input and the level at the RCV line output will be measured in TEST_03 - Voice Transceiver.

PARAMETER_44 TX stepping PA pwr lvls tested [0-127]

Enter the desired value to set the output power levels that will be tested. The entry is a binary word, expressed in decimal. Select the power levels at which you wish to test from the list below and add the numbers after the equal sign. Power level 0 is always tested.

- Power level 1 = 1
- Power level 2 = 2
- Power level 3 = 4
- Power level 4 = 8
- Power level 5 = 16
- Power level 6 = 32
- Power level 7 = 64

For example, if you wish to test power levels 0, 1, 4, and 7, enter `73` (73=1+8+64) into the field. Enter `0` if you wish to test only power level 0. If you wish to test low power levels, you must use the spectrum analyzer to measure power (see PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]).

PARAMETER_45 TX voice peak limit step [1 - 200]

Enter the desired value (in Hz) to set the audio frequency step size for the transmitter peak deviation/limit verification test. The step size can be in the range 1 to 200 Hz.

PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

Enter the desired control choice to determine whether the Test Set spectrum analyzer or power meter will be used to measure the Base Station RF power output. Use the following criteria to determine your choice:

- If there are multiple high-level signals present, you must make the measurement with a spectrum analyzer.
- For the most accurate measurement of one high-level signal, you should use the power meter.
- If you are using the In-Service Optimization mode, you should use the spectrum analyzer.
- If you are testing in the MANUAL mode, you should use the power meter.

You must verify that adequate power is applied to the Test Set RF IN/OUT connector if you are using the power meter. The power applied must be greater than 17 dBm.

Calibration and testing must be performed with the same instrument, either power meter or spectrum analyzer.

PARAMETER_47 ZZZZ Test mode [0=normal 1=demo]

Enter the desired control choice to determine whether the Test Software will disable Base Station communication and allow its use in training or demonstration operations. This affects tests that do not require communication with the Base Station. Make certain that you set this parameter to `0` if you wish to perform tests. If it is set to `1`, training or demonstration can take place and simulated values for test results will be displayed.

If this parameter is set to `1`, and you initiate a TEST, the Test Software will display the following message in large type:

```
RUNNING IN DEMO MODE.
RESULTS WILL BE INVALID.
PRESS CONTINUE TO PROCEED.
```

If the Test Software displays this message, and you wish to operate the system in demo mode, press the **Pause/Continue** key. If the Test Software displays this message, but you wish to make actual measurements, press the **Shift** and then the **Pause/Continue** (**Reset**) key to stop the TEST, re-set the parameter to 0, and start the TEST again.

PARAMETER_48 GN Stop test if results fail [0=no 1=yes]

Enter the desired control choice to determine the testing status in the event that a test fails. Select 0 to continue testing on failure; select 1 to stop on a failure.

NOTE See "PARAMETER_03 GN perform adj [0=no 1=on fail 2 =always]" on page 125, which provides for adjustment and re-testing the Base Station when failures occur.

If you select 1, upon failure when testing, the Test Set USER keys will provide choices on how to proceed. Press the associated key for the following:

- **`Proceed`** - The Test Software will proceed with testing despite the failed data point. The next test of the sequence will be performed.
- **`Laptop`** - The Test Software will display the Terminal Emulator Mode screen. This screen allows you to send control commands to the radio when such commands are required to continue testing.

PARAMETER_49 EXTERNAL SWITCH [0=off 3=83202A]

NOTE In some instances, it will be beneficial to use a six-way external Splitter or Switch Matrix between the Test Set duplex output and the Base Station antenna inputs. This will reduce the number of connections that must be made during testing.

Enter the desired control choice to indicate whether the Agilent Technologies 83202A Switch Matrix will be used in testing. Note that this parameter will also allow you to select a Splitter (enter 1) or an Agilent Technologies 3488 Switch Matrix (enter 2). However, it is recommended that you not change the setting of this parameter. Instead, proceed as follows to allow the Test Software to make the setting:

- Select the **`External Switch Setup`** field in the Configuration Menu screen. The Test Software will display the External Switch Setup screen.
- Select the **`Antenna Control`** field in the External Switch Setup screen and select the desired item from the drop-down **`Choices:`** list.
- Select the **`Return`** field. The Test Software will display the Configuration Menu screen again.

PARAMETER_50 SKIPS [1=SKIPJK 2=SKIP RDM LEV 3=BOTH]

Enter the desired control choice to determine whether the signal at test point JK, or the RDM level connector, or both will be skipped in testing. Note that this parameter will also allow you to elect to skip neither point (select 0).

Pass/Fail Limit Specification Descriptions

Pass/fail limits define the values with which a measurement result is compared to determine if the system under test meets specified standards.

For information on editing Pass/Fail Limit Specifications, see "Customizing Test Procedures" on page 50.

All pass/fail limits include lower and upper limits that may be entered or modified. The column labeled **Check** on the TESTS (Pass/Fail Limits) screen specifies whether the lower limit, the upper limit, or both of the limits will be used when compared with measurements. Some of the default pass/fail limits provided in the Test Software include only one of the limits. If you enter the other limit, make certain that you change the **Check** column to **Both**.

Pass/fail limits remain in battery-backed-up memory until you select a procedure to run. If you wish to prevent limits from being lost when a new procedure is selected, save those in a procedure. See "Saving/Deleting Procedures to/from a Card" on page 57 or "Saving/Deleting Procedures to/from Internal RAM" on page 61.

Pass/fail limits may be secured.

The list of pass/fail limits is arranged alphabetically. The first two or three letters in the title of each pass/fail limit indicate its classification. The classifications are:

- **RDM** – Reference Distribution Module
- **RX** – Receiver
- **TX** – Transmitter

PASS/FAIL LIMIT_01 RDM frequency error

Enter the desired values (in Hz) for the acceptable frequency error caused by the RDM or URDM 3-MHz reference signal. The frequency error displayed is the frequency error of the voice transmitter and voice receiver, not the frequency error referenced to 3 MHz.

PASS/FAIL LIMIT_02 RDM output level

Enter the desired values (in volts peak-to-peak) for the maximum and minimum levels of the 3-MHz reference signal voltage.

PASS/FAIL LIMIT_03 RX audio distortion

Enter the desired values (in percent) for the maximum acceptable distortion of a 1-kHz rate sine wave after it is output from the receiver.

PASS/FAIL LIMIT_04 RX audio output level

Enter the desired values (in dBm) for the window of acceptable receiver output power that results from an input signal modulated with a standard deviation at a 1-kHz rate. The standard deviation is 2.9 kHz (AMPS) and 1.5 kHz (NAMPS). The receiver output power is based on the voltage applied to a 600-ohm load.

PASS/FAIL LIMIT_05 RX audio response dev from -6 dB/oct R1

Enter the desired values (in dB) for the acceptable level variation of the audio output compared to the expected response. The frequency response should result in reducing the output level by 6 dB when the audio frequency is doubled. This pass/fail limit sets the deviation from this ideal response for audio frequencies in the range of 0.4 to 2.4 kHz. The frequency response is checked from 0.3 to 3 kHz.

PASS/FAIL LIMIT_06 RX audio response dev from –6 dB/oct R2

Enter the desired values (in dB) for the acceptable level variation of the audio output compared to the expected response. The frequency response should result in reducing the output level by 6 dB when the audio frequency is doubled. This pass/fail limit sets the deviation from this ideal response below 0.4 kHz and above 2.4 kHz. The frequency response is checked from 0.3 to 3 kHz.

PASS/FAIL LIMIT_07 RX expandor track error <0 dB

Enter the desired values (in dB) to increase the output level by 2 dB for every 1-dB increase in input level. This pass/fail limit sets the acceptable deviation from the desired characteristic for levels less than a 2.9 kHz (AMPS) or 1.5 kHz (NAMPS) reference deviation.

PASS/FAIL LIMIT_08 RX expandor track error >0 dB

Enter the desired values (in dB) to increase the output level by 2 dB for every 1-dB increase in input level. This pass/fail limit sets the acceptable deviation from the desired characteristic for levels greater than a 2.9 kHz (AMPS) or 1.5 kHz (NAMPS) reference deviation.

PASS/FAIL LIMIT_09 RX hum and noise

Enter the desired values (in dB) to sets the minimum acceptable ratio of the level of a 1-kHz sine wave output to the level of the noise that is present when the signal generator is not modulated.

PASS/FAIL LIMIT_10 RX scan and sig calibration reading

Enter the desired values (in dBm) to set the level that is compared with the reported RSSI level during the calibration of a scan or SIG receiver. If the upper and lower limits are set to -90 dBm, the test will fail if there is any offset from -90 dBm. Calibration can then be performed.

PASS/FAIL LIMIT_11 RX scan sig linearity error

Enter the desired values (in dB) to set the maximum acceptable deviation between the level that the scan or SIG receiver reports and the level applied to the scan receiver by the Test Set, while the linearity test is running.

PASS/FAIL LIMIT_12 RX sensitivity with LNA

Enter the desired values (in dBm) to set the signal generator level that is applied to an AMPS receiver with a low noise amplifier (LNA) during SINAD tests.

PASS/FAIL LIMIT_13 RX sensitivity without LNA

Enter the desired values (in dBm) to set the signal generator level that is applied to an AMPS receiver without a low noise amplifier (LNA) during SINAD tests.

PASS/FAIL LIMIT_14 RX sensitivity without LNA narrow mode

Enter the desired values (in dBm) to set the signal generator level that is applied to an NAMPS receiver during SINAD tests.

PASS/FAIL LIMIT_15 RX SINAD at sensitivity spec

Enter the desired values (in dB) to set the SINAD level used during sensitivity tests. If the measured SINAD is greater than this pass/fail limit, the RX sensitivity test will pass.

PASS/FAIL LIMIT_16 TX audio distortion

Enter the desired values (in percent) to set the acceptable distortion of the transmitter modulation at a 1-kHz rate.

PASS/FAIL LIMIT_17 TX audio response dev from 6 dB/oct

Enter the desired values (in dB) to set the maximum acceptable level variation of the modulation on the transmitter signal compared to the expected response. The frequency response should result in a deviation increasing by 6 dB when the frequency is doubled. This pass/fail limit sets the deviation from this ideal response. The frequency response is checked from 0.3 to 3 kHz.

PASS/FAIL LIMIT_18 TX compressor track error <0 dB

Enter the desired values (in dB) to increase the output level by 1 dB for every 2-dB increase in input level. This pass/fail limit sets the acceptable deviation from the desired characteristic for levels less than a 2.9 kHz (AMPS) or 1.5 kHz (NAMPS) reference deviation.

PASS/FAIL LIMIT_19 TX compressor track error >0 dB

Enter the desired values (in dB) to increase the output level by 1 dB for every 2-dB increase in input level. This pass/fail limit sets the acceptable deviation from the desired characteristic for levels greater than a 2.9 kHz (AMPS) or 1.5 kHz (NAMPS) reference deviation.

PASS/FAIL LIMIT_20 TX data deviation

Enter the desired values (in kHz) to set the maximum and minimum acceptable peak frequency deviation of the wideband data signal.

PASS/FAIL LIMIT_21 TX DSAT deviation

Enter the desired values (in Hz) to set the maximum and minimum acceptable peak frequency deviation of the DSAT signal in an NAMPS transmitter.

PASS/FAIL LIMIT_22 TX FM hum and noise

Enter the desired values (in dB) to set the minimum acceptable ratio of the level of a 1-kHz tone, modulated on the transmitter, to the level of the noise that is present when the transmitter is not modulated.

PASS/FAIL LIMIT_23 TX frequency error

Enter the desired values (in ppm) to set the acceptable ratio, in parts per million, of the difference between the measured and assigned transmitter frequencies, to the assigned transmitter frequency. The error will usually be contributed by the RDM or URDM.

PASS/FAIL LIMIT_24 TX loop-back level

Enter the desired values (in dBm) to set the acceptable level at the RCV line output when the average voice level (AVL) is applied to the TX line input during the loop-back test.

PASS/FAIL LIMIT_25 TX output power error at level 0

Enter the desired values (in percent) to set the acceptable difference in the measured power of a voice transmitter and the nominal output power at the stated power level. (The nominal output power is entered into the Test Software as a parameter value.)

PASS/FAIL LIMIT_26 TX output power error at level 1

Same as Pass/Fail Limit 25, except for level 1.

PASS/FAIL LIMIT_27 TX output power error at level 2

Same as Pass/Fail Limit 25, except for level 2.

PASS/FAIL LIMIT_28 TX output power error at level 3

Same as Pass/Fail Limit 25, except for level 3.

PASS/FAIL LIMIT_29 TX output power error at level 4

Same as Pass/Fail Limit 25, except for level 4.

PASS/FAIL LIMIT_30 TX output power error at level 5

Same as Pass/Fail Limit 25, except for level 5.

PASS/FAIL LIMIT_31 TX output power error at level 6

Same as Pass/Fail Limit 25, except for level 6.

PASS/FAIL LIMIT_32 TX output power error at level 7

Same as Pass/Fail Limit 25, except for level 7.

PASS/FAIL LIMIT_33 TX output power error for signaling unit

Enter the desired values (in percent) to set the maximum acceptable difference in the measured power level of a signaling transmitter and the nominal output power. (The nominal output power is entered into the Test Software as a parameter value.)

PASS/FAIL LIMIT_34 TX SAT deviation

Enter the desired values (in kHz) to set the maximum and minimum acceptable frequency deviation of the SAT.

PASS/FAIL LIMIT_35 TX SAT frequency error

Enter the desired values (in Hz) to set the maximum acceptable error of the 5970-Hz, 6000-Hz, or 6030-Hz supervisory audio tones (SATs).

PASS/FAIL LIMIT_36 TX test point JK output (dBm)

Enter the desired values (in dBm) to set the maximum and minimum acceptable TX TEST JK audio power calculated into a 600-ohm load.

PASS/FAIL LIMIT_37 TX voice deviation

Enter the desired values (in kHz) to set the maximum and minimum acceptable peak frequency deviation that results when the AVL voltage is applied to an AMPS transmitter. The modulation signal is a 1-kHz tone.

PASS/FAIL LIMIT_38 TX voice deviation narrow mode

Enter the desired values (in kHz) to set the maximum and minimum acceptable peak frequency deviation that results when the AVL voltage is applied to an NAMPS transmitter. The modulation signal is a 1-kHz tone.

PASS/FAIL LIMIT_39 TX voice limiting deviation

Enter the desired values (in kHz) to set the maximum acceptable frequency deviation of an AMPS transmitter caused by a high-level modulating signal.

PASS/FAIL LIMIT_40 TX voice limiting deviation narrow mode

Enter the desired values (in kHz) to set the maximum acceptable frequency deviation of an NAMPS transmitter caused by a high-level modulating signal.

A Appendix: Test Set Measurement Settings

This appendix contains some of the Test Set default settings made by the Test Software. Many settings are determined by EIA standards and Motorola recommended procedures. This appendix does not cover all of the Test Set settings required by these standards or procedures.

Introduction

This appendix includes Test Set settings that are useful to know when performing manual methods of measurement described in the standards or procedures. This appendix is intended to be used with EIA and Motorola methods of measurement.

The types of settings are listed below:

- Filter choices
- Audio level detectors used
- Frequency counter gate times
- Spectrum analyzer sweep conditions and display resolution

Test Set settings are not made in the following TESTs:

- TEST_01 - Laptop Emulator
- TEST_11 - Test Menu

Test Set measurement hardware is not used in the following TESTs:

- TEST_08 -Manual Switch and Calibration Aid
- TEST_09 - Calculate Transmitter Power

TEST_02 - URDM or RDM Frequency/Level

The following settings are used for the tests:

URDM (or RDM) #1/#2 frequency error

Frequency measurement gate time = 1 s

URDM (or RDM) #1/#2 level

Spectrum analyzer center frequency = 3 MHz

Spectrum analyzer span = 50 kHz

Spectrum analyzer display resolution = 2 dB/div

TEST_03 - Voice Transceiver

The following settings are used for the tests:

RX audio output (with adjustment)

Filter 1: C-Message

Filter 2: > 99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX SINAD for each antenna

Filter 1: C-Message

Filter 2: > 99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX audio distortion (extended test)

Filter 1: C-Message

Filter 2: > 99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX hum and noise (extended test)

Filter 1: C-Message

Filter 2: > 99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX expandor response (extended test)

Filter 1: C-Message

Filter 2: > 99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX audio response (extended test)

Filter 1: 50-Hz high-pass filter

Filter 2: 15-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX signal SAT/DSAT

Filter and detector settings are not required for this test.

RX no signal SAT/DSAT

Filter and detector settings are not required for this test.

RX signal ST/DST detect

Filter and detector settings are not required for this test.

RX no signal ST/DST detect

Filter and detector settings are not required for this test.

TX frequency error

Frequency measurement gate time = 0.5 s

TX power @ level 0 (with adjustment)

The power meter or the spectrum analyzer may be used (see PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]

If using the spectrum analyzer: Span = 50 kHz; Resolution = 2 dB/div.

TX SAT frequency error

Filter 1: 300-Hz high-pass filter

Filter 2: 15-kHz low-pass filter

Audio frequency gate time = 1 s

IF filter: 30 kHz

TX SAT/DSAT peak deviation (with adjustment)

Filter 1: 300-Hz high-pass filter (SAT)

Filter 2: 15-kHz low-pass filter (SAT)

Filter 1: < 20-Hz high-pass filter (DSAT)

Filter 2: 300-Hz low-pass filter (DSAT)

Detector: RMS corrected to peak (SAT)

Detector (adjustment): RMS corrected to peak (SAT)

Detector (adjustment): Peak+/- max (DSAT)

Decoder: DSAT

TX TEST JACK output (with adjustment)

Filter 1: 300-Hz high-pass filter

Filter 2: 3-kHz low-pass filter

Detector: RMS

Audio In LO: Float

TX/RX loopback

Filter 1: C-Message

Filter 2: >99-kHz low-pass filter

Detector: RMS

Audio In LO: Float

TX peak voice limiting (with adjustment)

Filter 1: <20-Hz high-pass filter

Filter 2: >99-kHz low-pass filter

Detectors: Peak+, Peak–

Detector (adjustment): Peak+/–max

IF filter: 30 kHz

TX voice deviation (with adjustment)

Filter 1: 300-Hz high-pass filter

Filter 2: 3-kHz low-pass filter

Detectors: Peak+, Peak–

Detector (adjustment): Peak+/–max

IF filter: 30 kHz

TX audio distortion (extended test)

Filter 1: C-Message filter

Filter 2: >99-kHz low-pass filter

De-emphasis: 750 µs

Detectors: RMS

IF filter: 30 kHz

TX hum and noise (extended test)

Filter 1: C-Message filter

Filter 2: >99-kHz low-pass filter

De-emphasis: 750 µs

Detector: RMS

IF filter: 30 kHz

TX compandor track error (extended test)

Filter 1: C-Message filter

Filter 2: >99 kHz low-pass filter

Detector: RMS

IF filter: 30 kHz

TX audio frequency response (extended test)

Filter 1: 50-Hz high-pass filter

Filter 2: 15-kHz low-pass filter

Detector: RMS

IF filter: 30 kHz

TX peak data deviation (in MANUAL mode)(with adjustment)

Filter 1: <20-Hz high-pass filter

Filter 2: >99-kHz low-pass filter

Detectors: Peak+, Peak–

IF filter: 230 kHz

TEST_04 - Signaling Transceiver MANUAL Mode

The following settings are used for the tests.

TX frequency error

- Frequency measurement gate time = 1 s

TX power (with adjustment)

The power meter or the spectrum analyzer may be used (see "PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]" on page 130).

If using the spectrum analyzer: Span = 2 MHz; Resolution = 2 dB/div.

TX data deviation (with adjustment)

Filter 1: <20-Hz high-pass filter

Filter 2: >99-kHz low-pass filter

Detectors: Peak+, Peak–

Detector (adjustment): Peak+/– max

IF filter: 230 kHz

RX SINAD

Filter 1: C-Message

Filter 2: >99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohm to Hi

RX SSI calibration and linearity

Filter and detector settings are not required for this test.

TEST_05 - Scanning Receiver MANUAL Mode

The following settings are used for the tests.

RX scan sensitivity for each antenna

Filter 1: C-Message

Filter 2: >99-kHz low-pass filter

Detector: RMS

Audio In Lo: 600 ohms to Hi

RX SAT/DSAT detect

Filter and detector settings are not required for this test.

RX SSI calibration and linearity

Filter and detector settings are not required for this test.

TEST_06 - Combiner Adjustment

The following settings are used for the test:

TX power with adjustment

The power meter or the spectrum analyzer may be used (see "PARAMETER_46 TX voice/signal pwr use [0=anz 1=pwrmtr]" on page 164).

If using the spectrum analyzer and a signaling channel: Span = 2 MHz, Resolution = 2 dB/div.

If using spectrum analyzer and a voice channel: Span = 50 kHz, Resolution = 2 dB/div.

TEST_07 - Wideband Data on Active Voice Channel

The following settings are used in the test:

Wideband data deviation on the selected voice channel

Filter 1: <20-Hz high-pass filter

Filter 2: >99-kHz low-pass filter

Detectors: Peak+/– max hold

IF filter: 30 kHz

TEST_08 -Manual Switch and Calibration Aid

This TEST does not use Test Set measurement hardware.

TEST_09 - Calculate Transmitter Power

This TEST does not use Test Set measurement hardware.

TEST_10 - Voice Channel Manual Test Mode

Filter and detector settings made in this TEST are the same as those made in TEST_03 - Voice Transceiver. See the measurement settings for that TEST.

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